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SCIENCE

17 February 1961

Vol. 133, No. 3451

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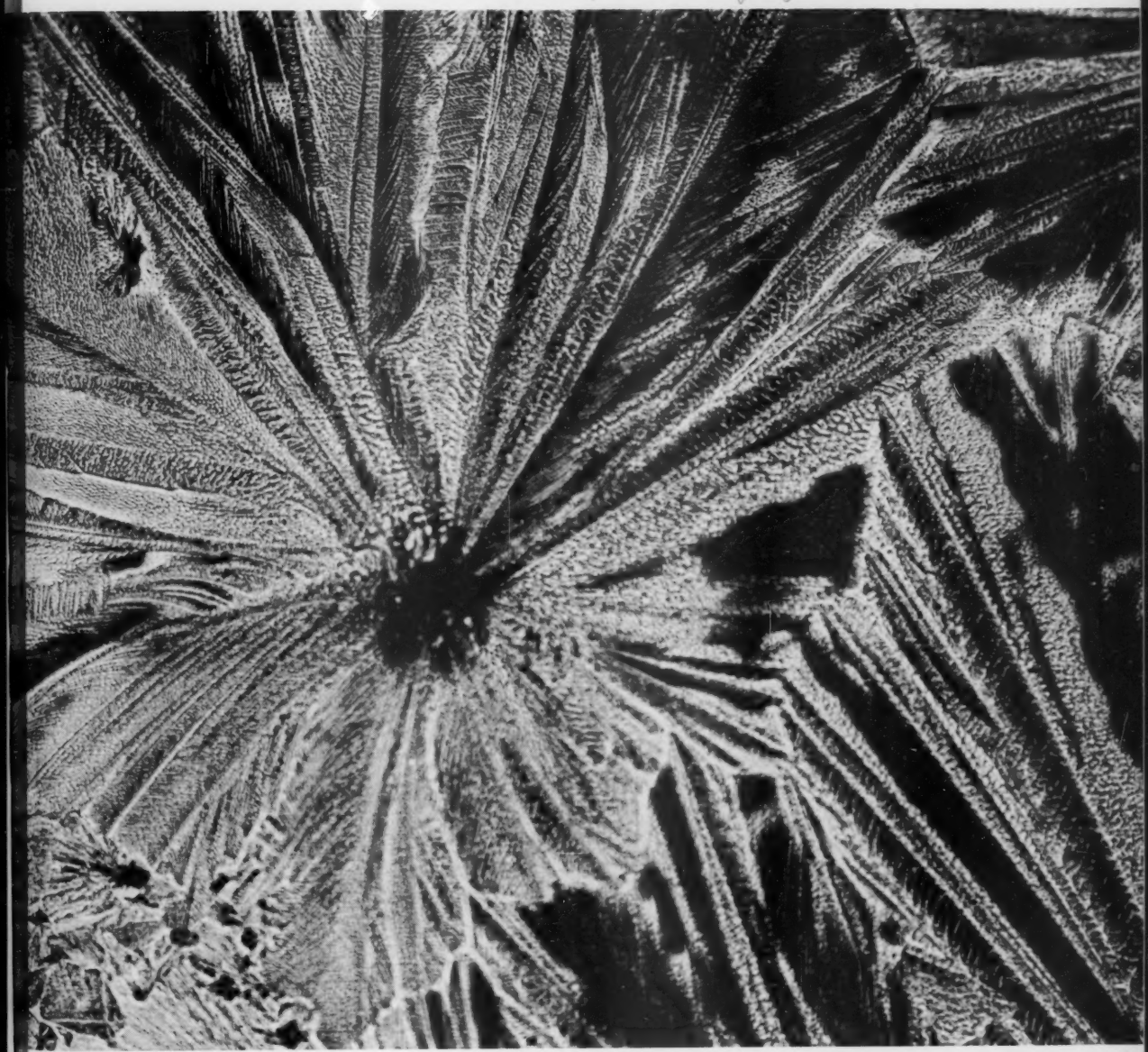

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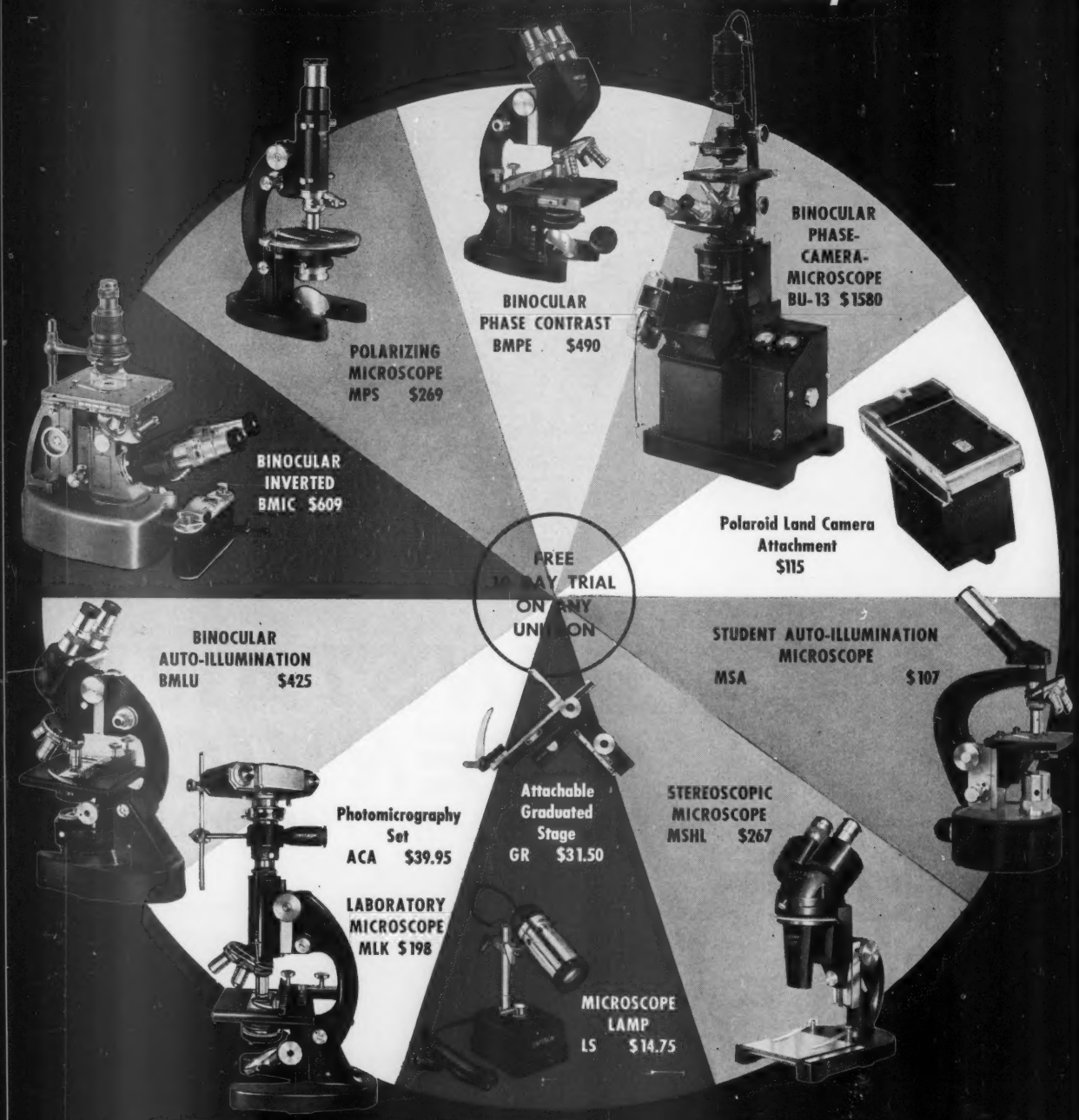
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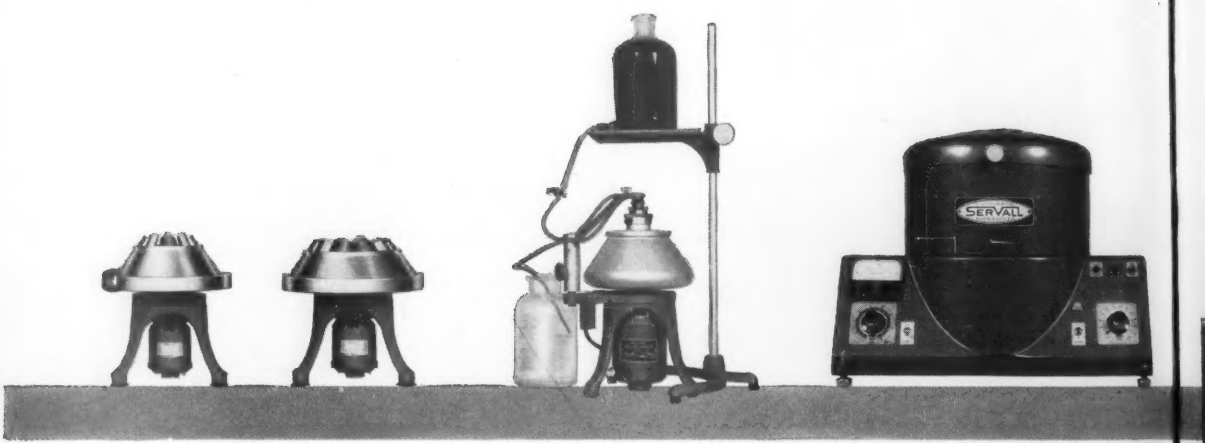

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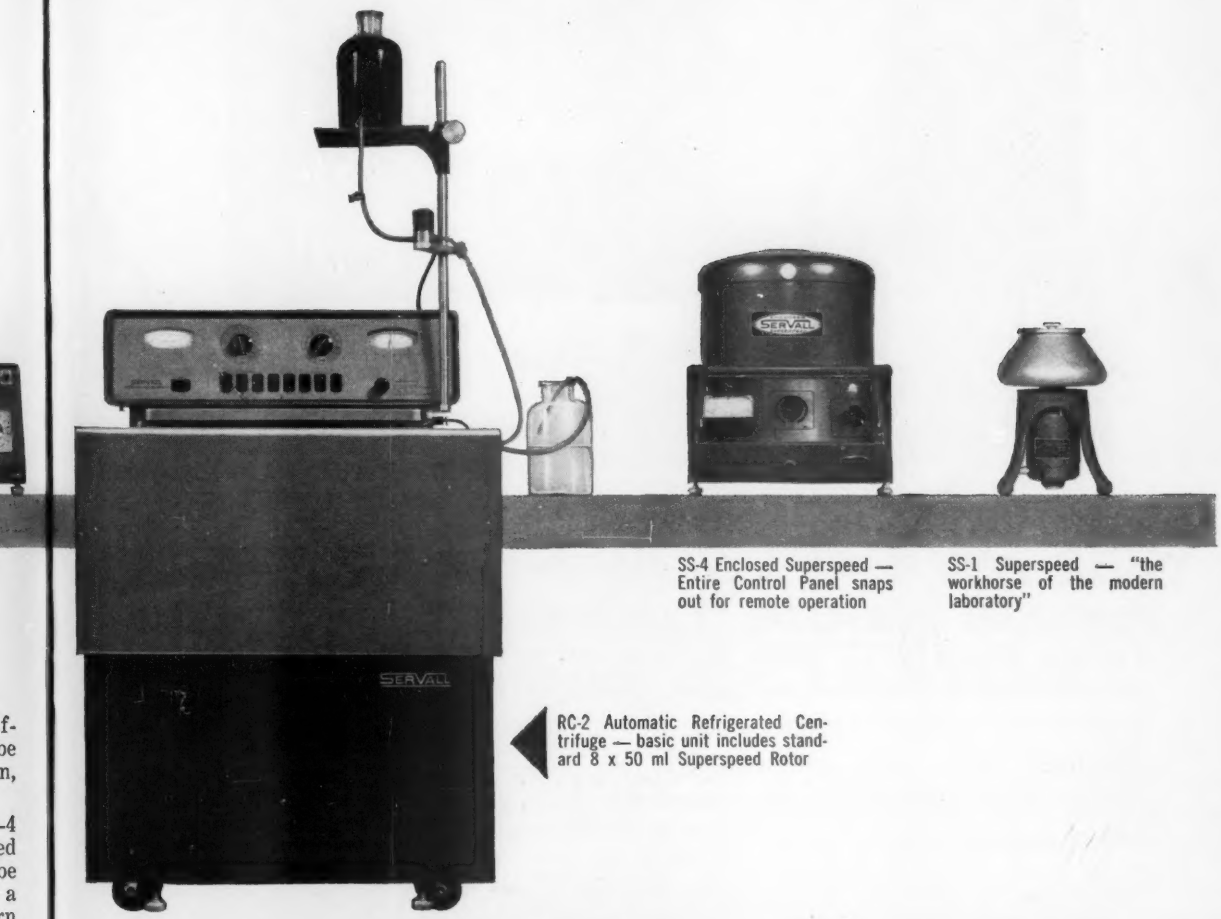

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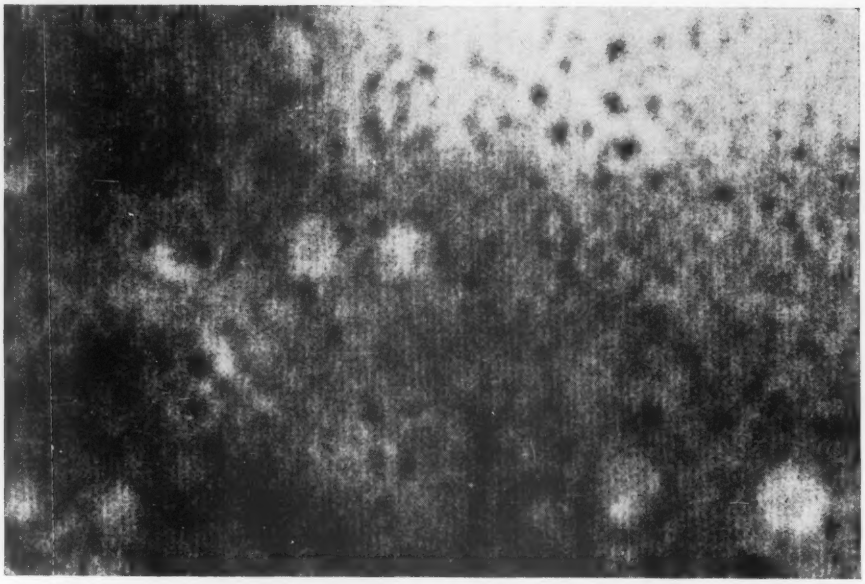

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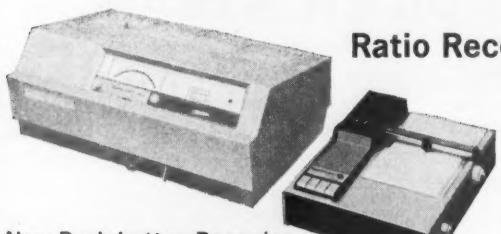

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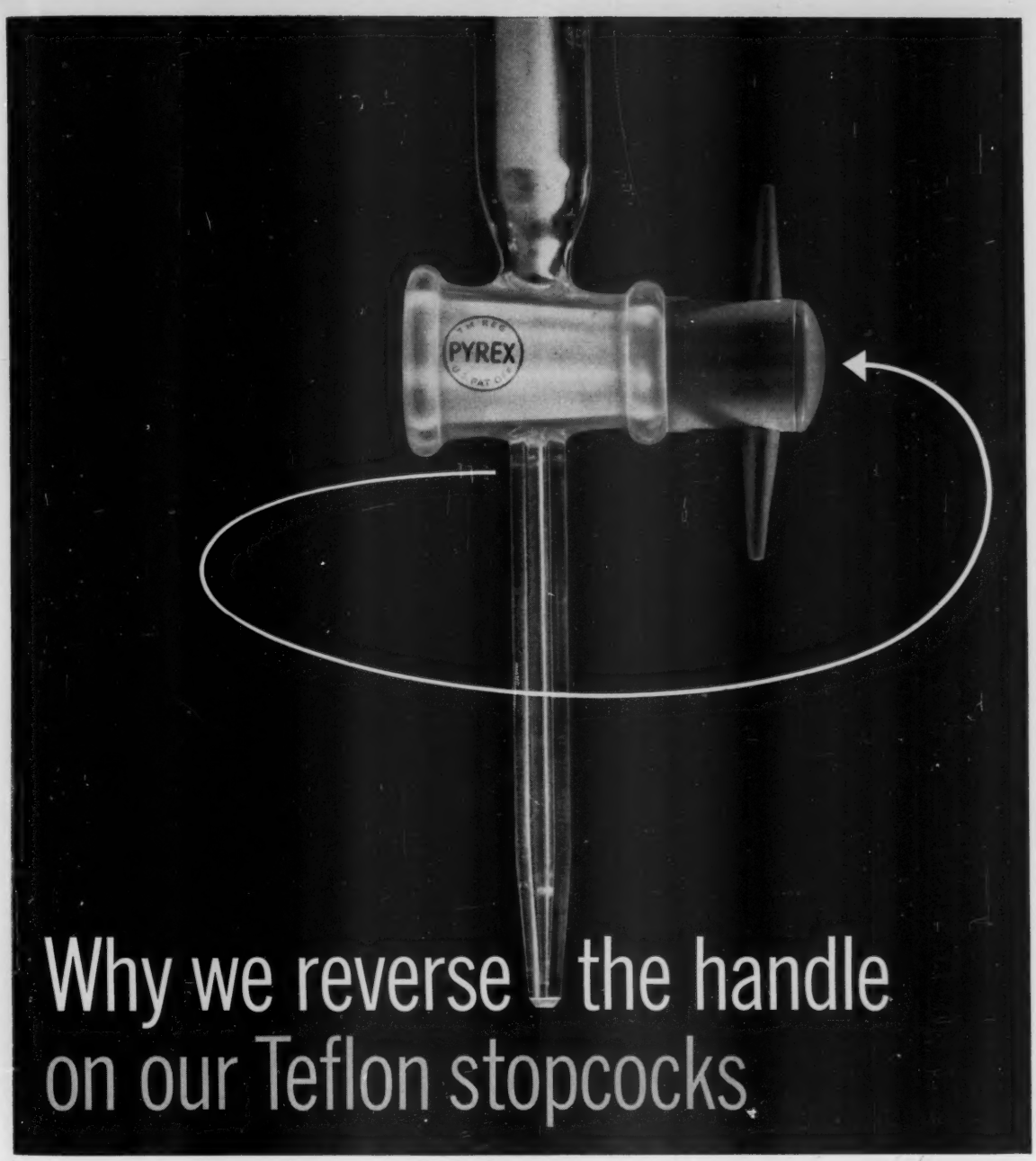

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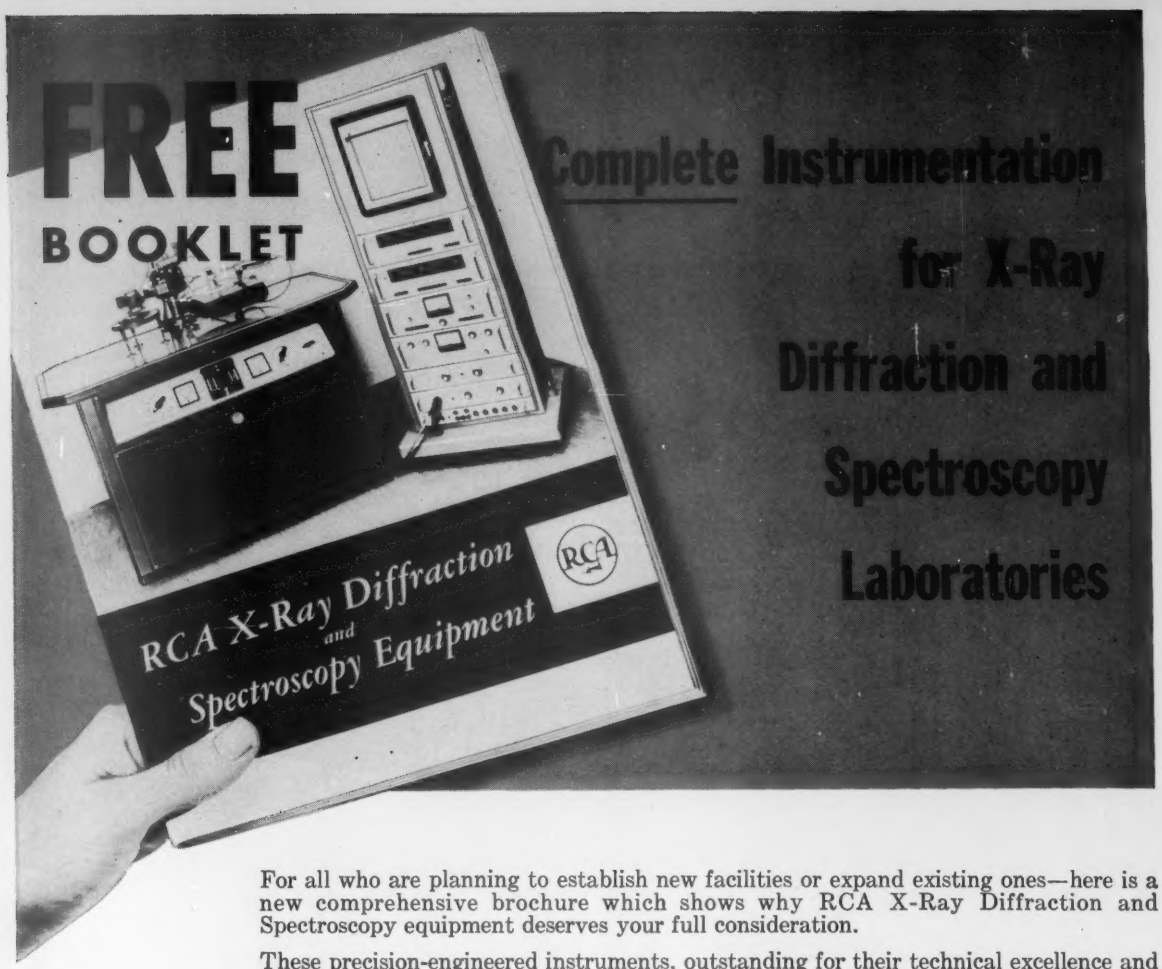

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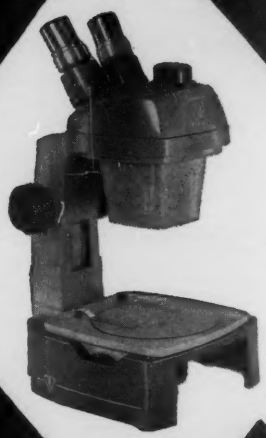

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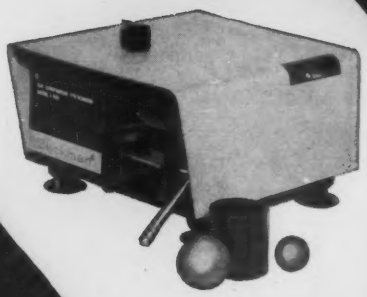

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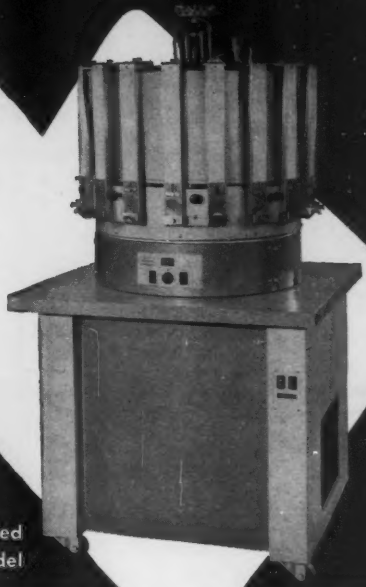

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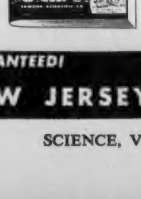

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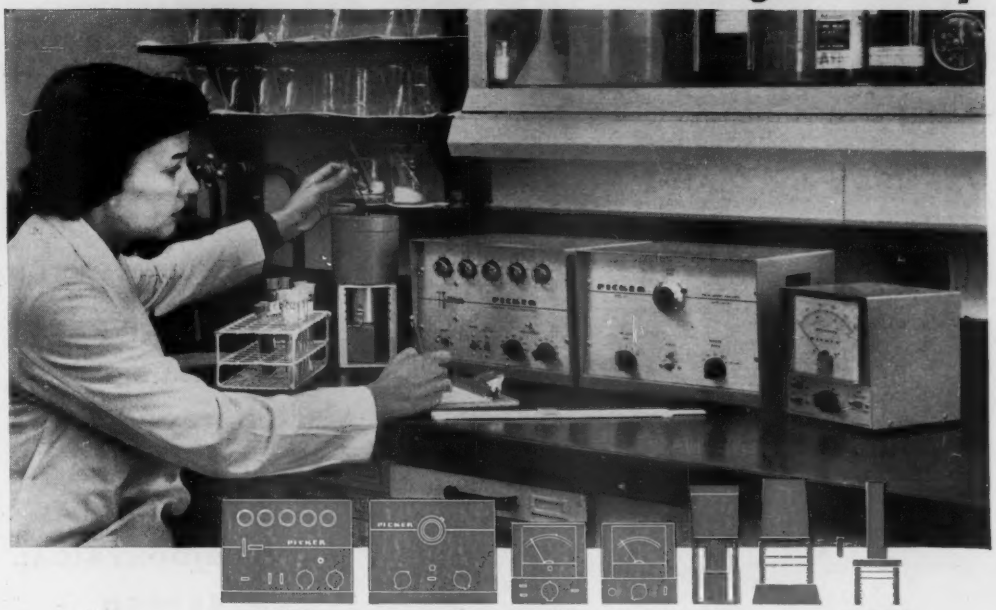

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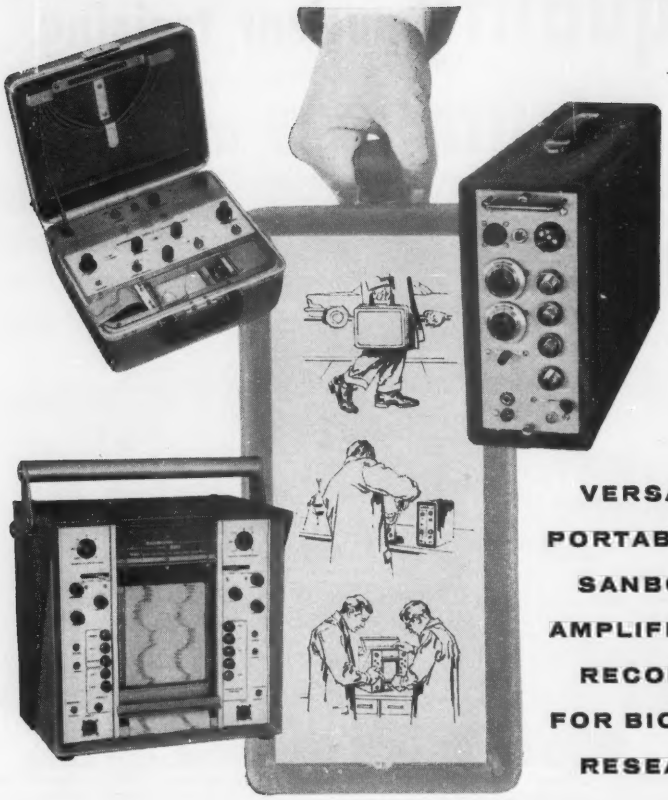

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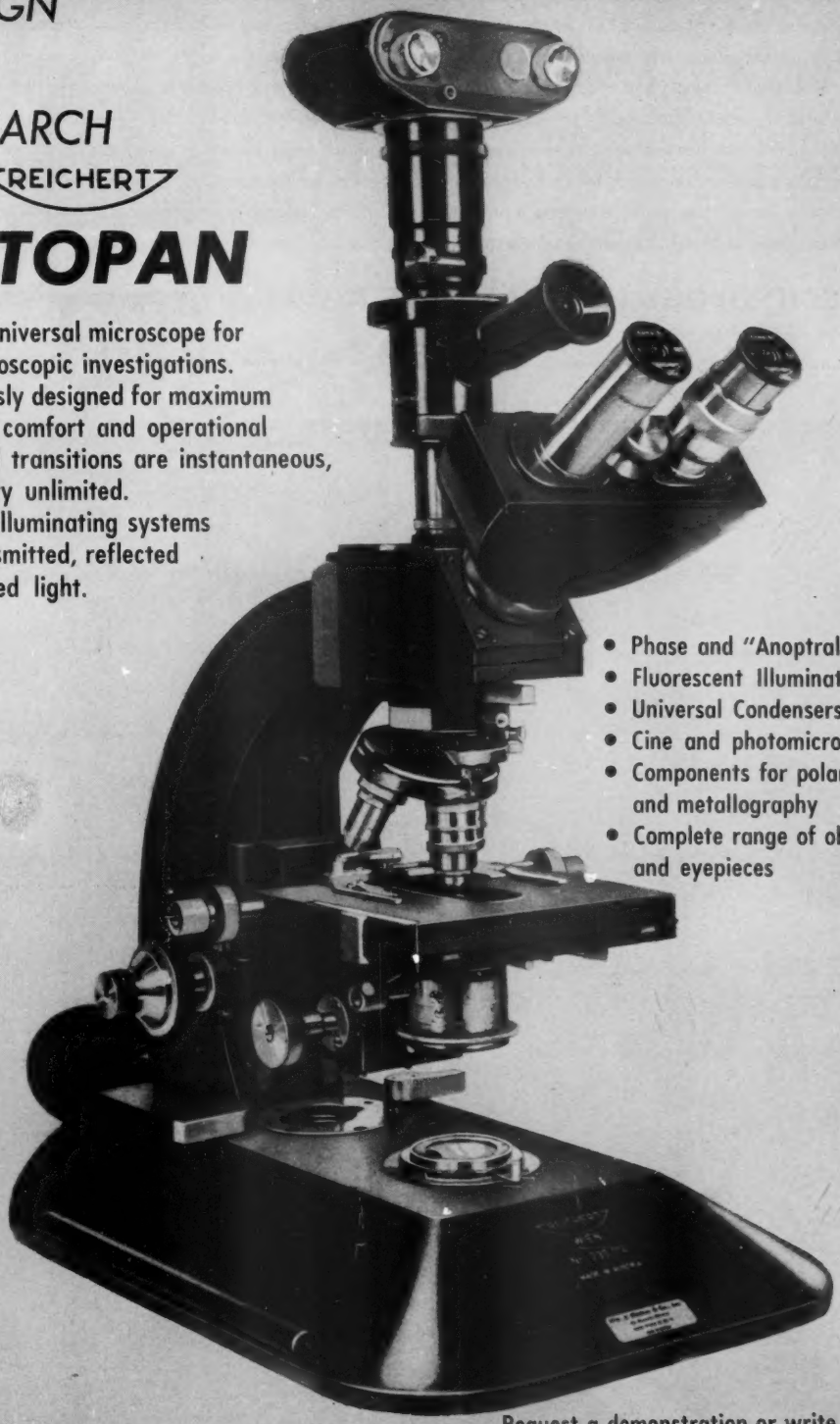

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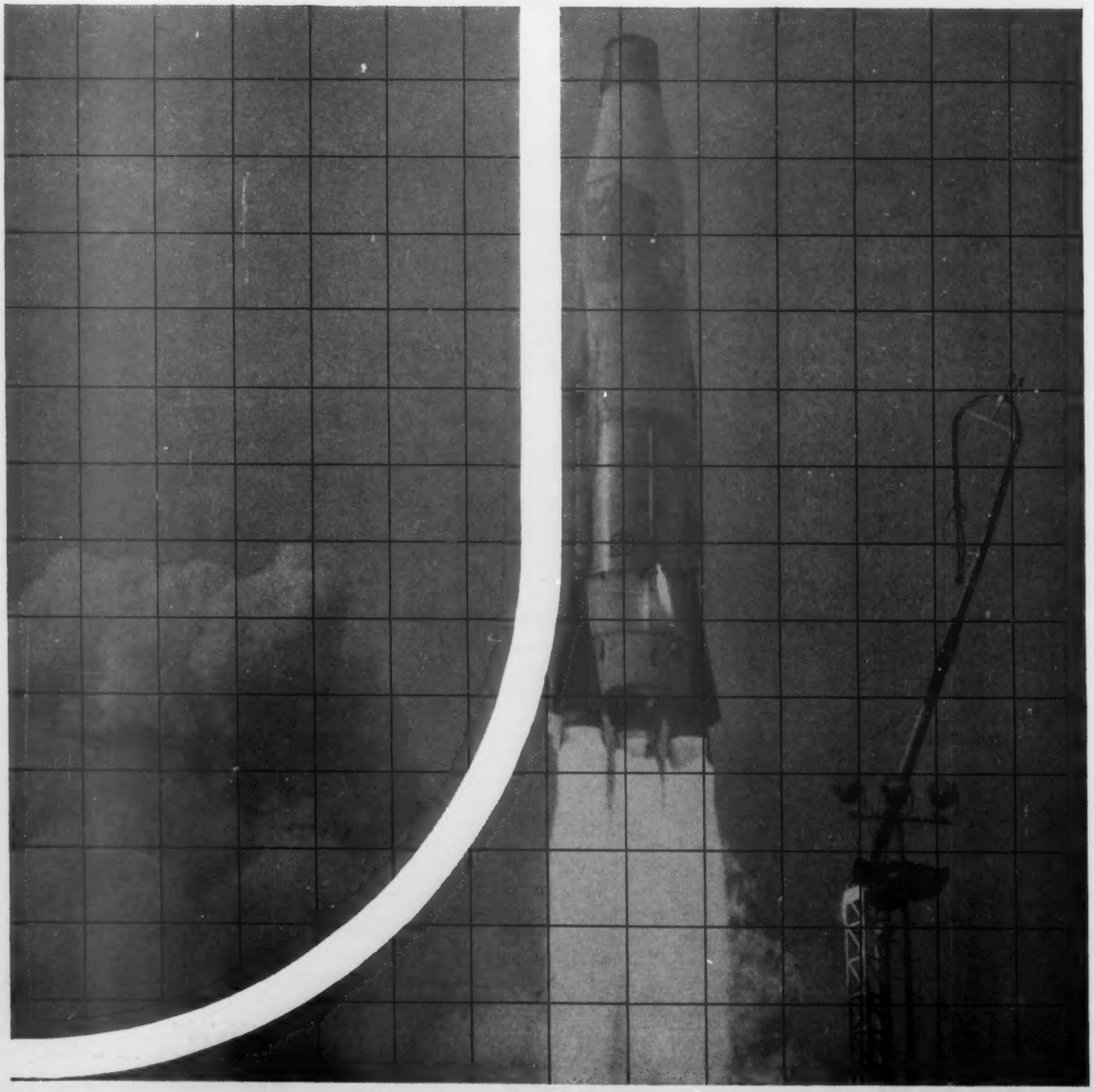

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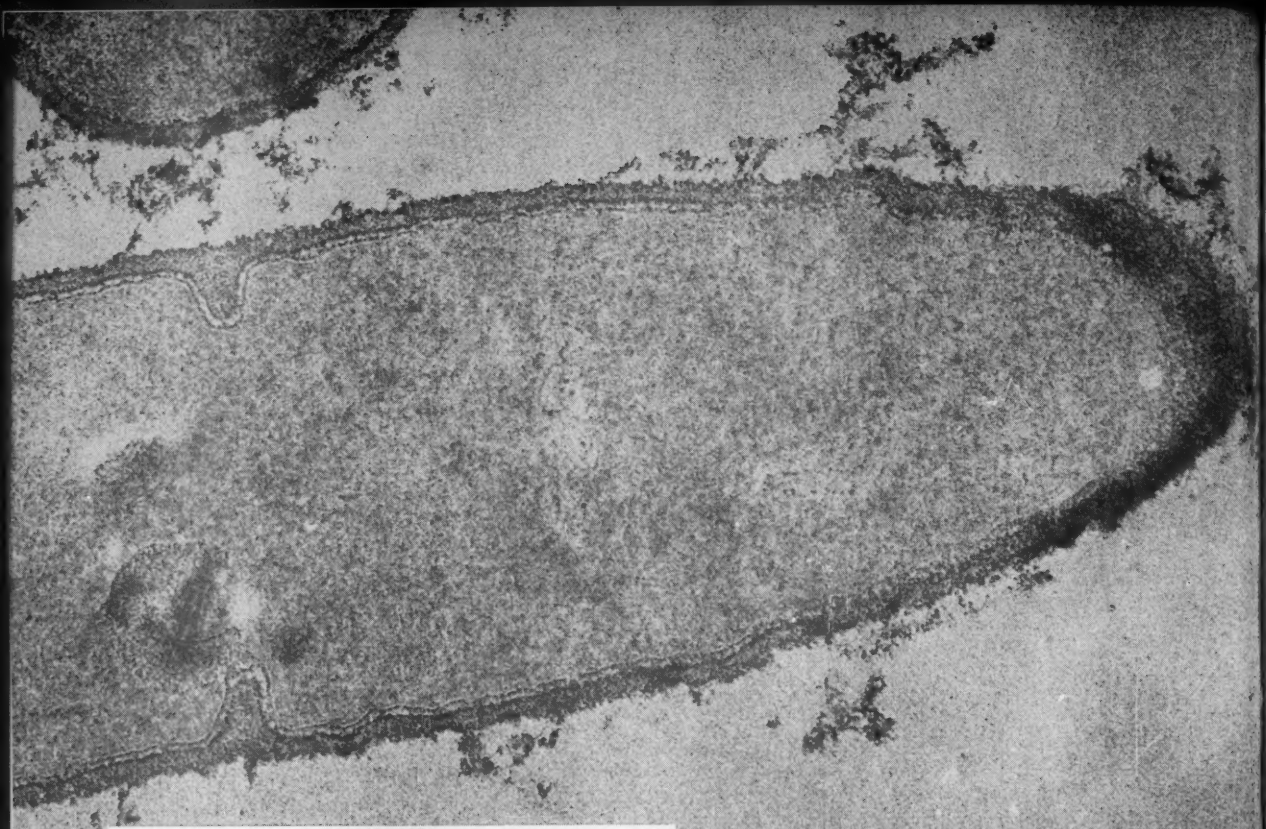

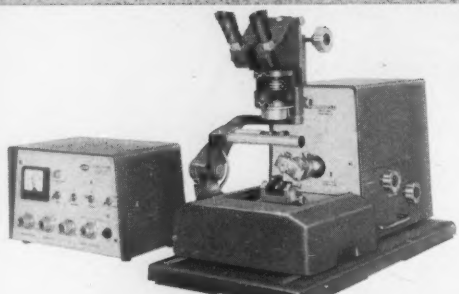

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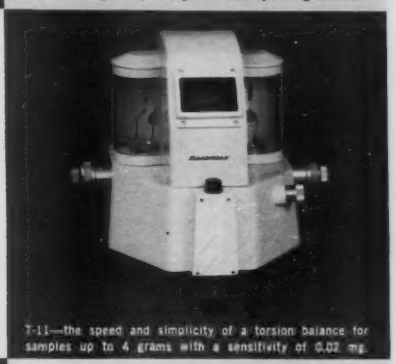

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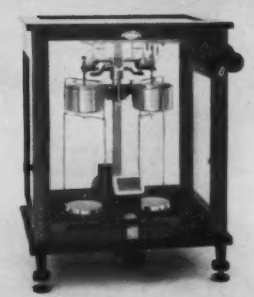

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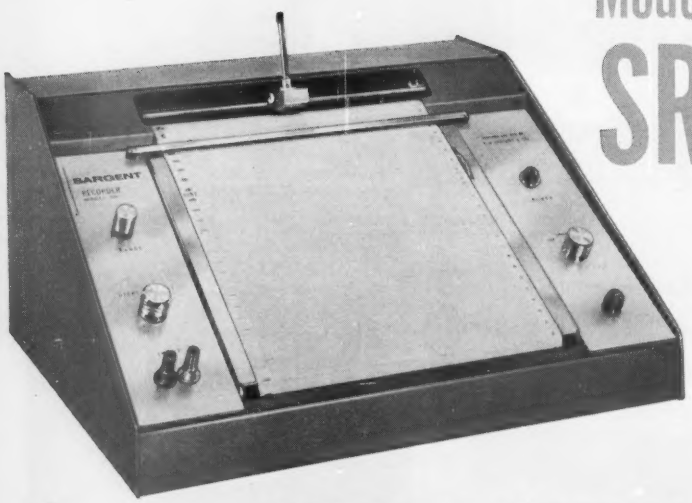

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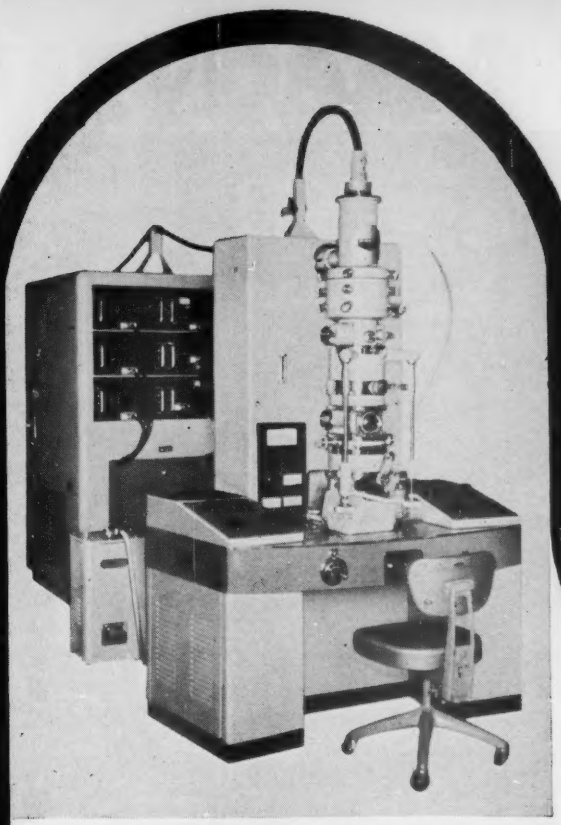

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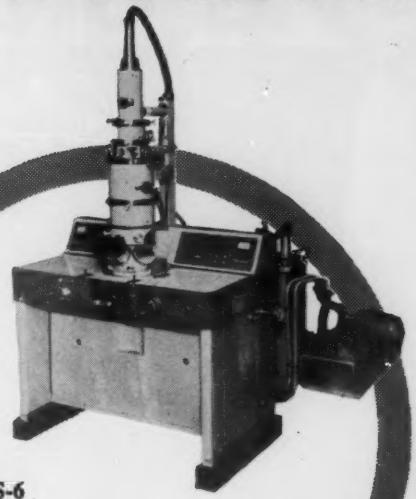

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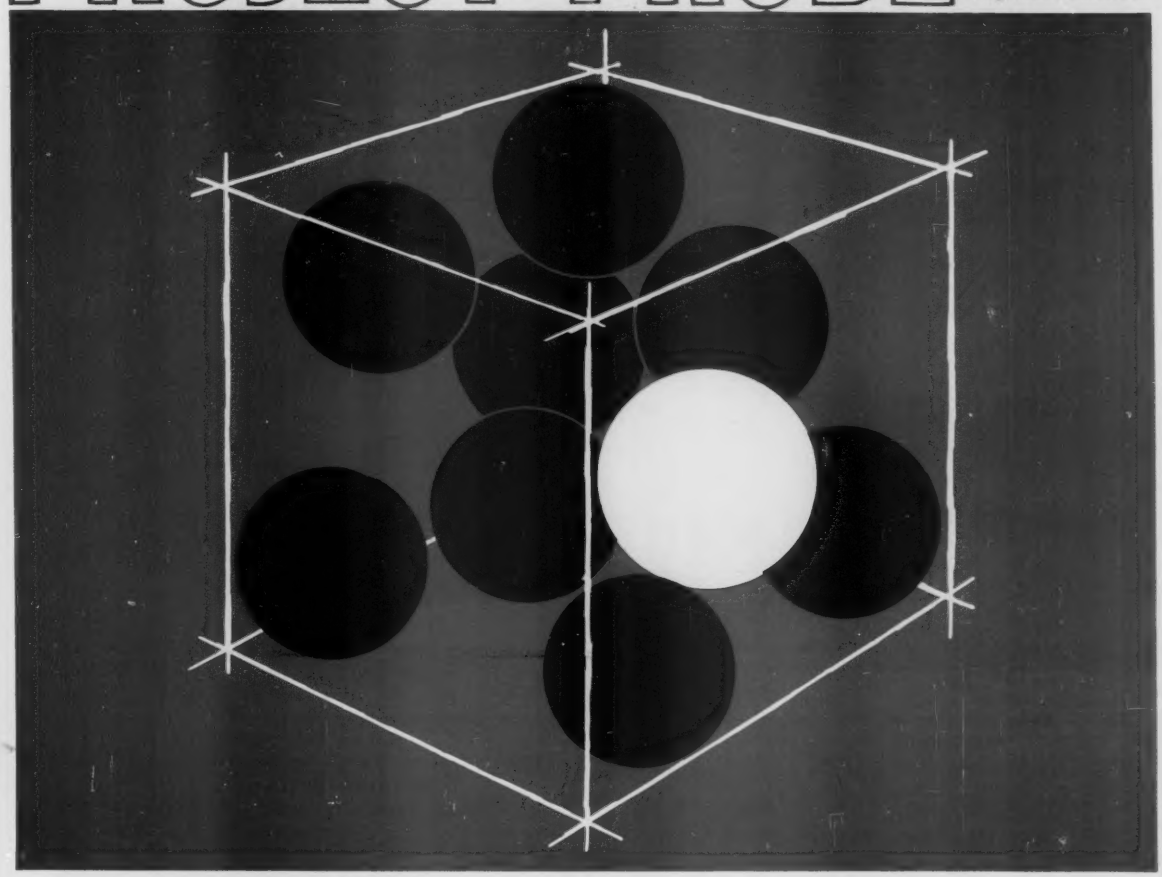

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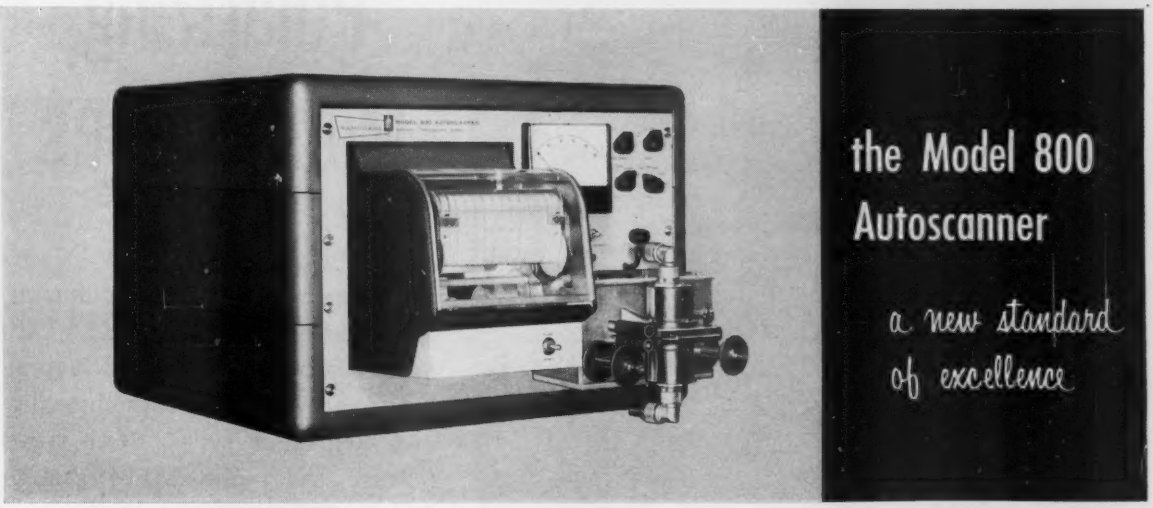

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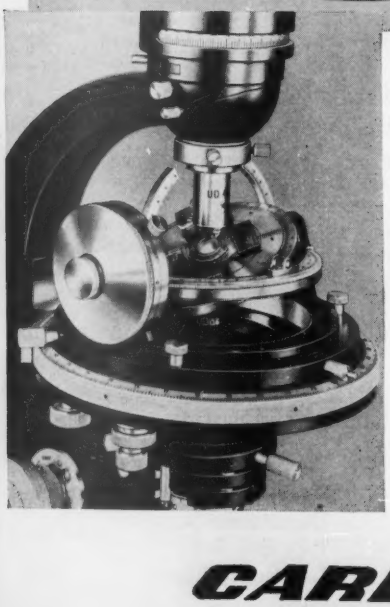

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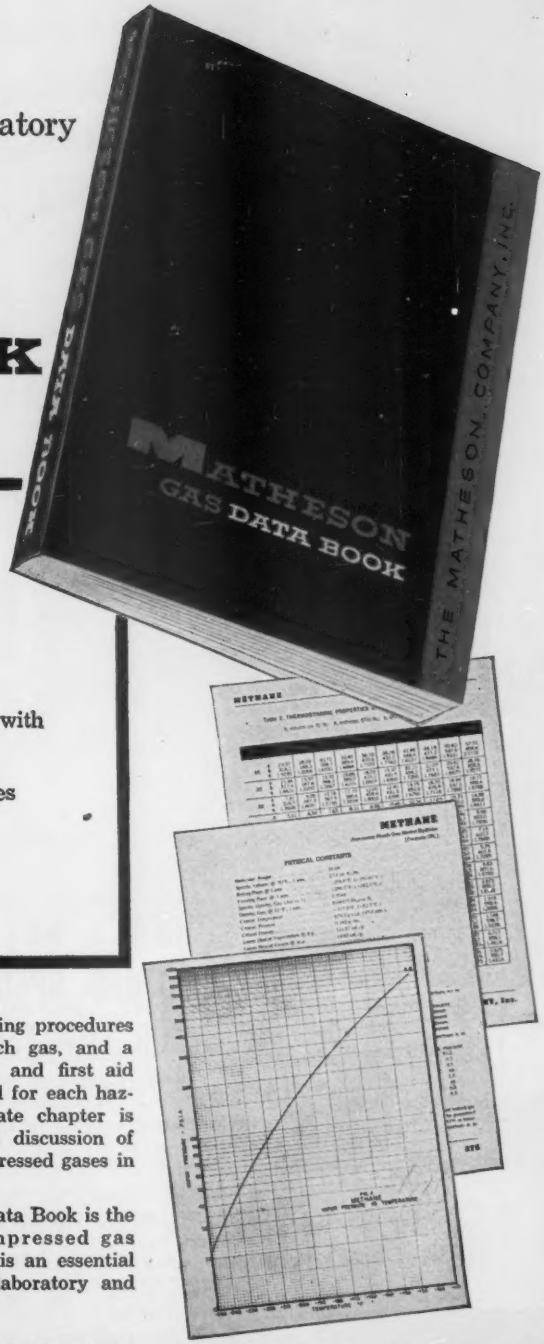

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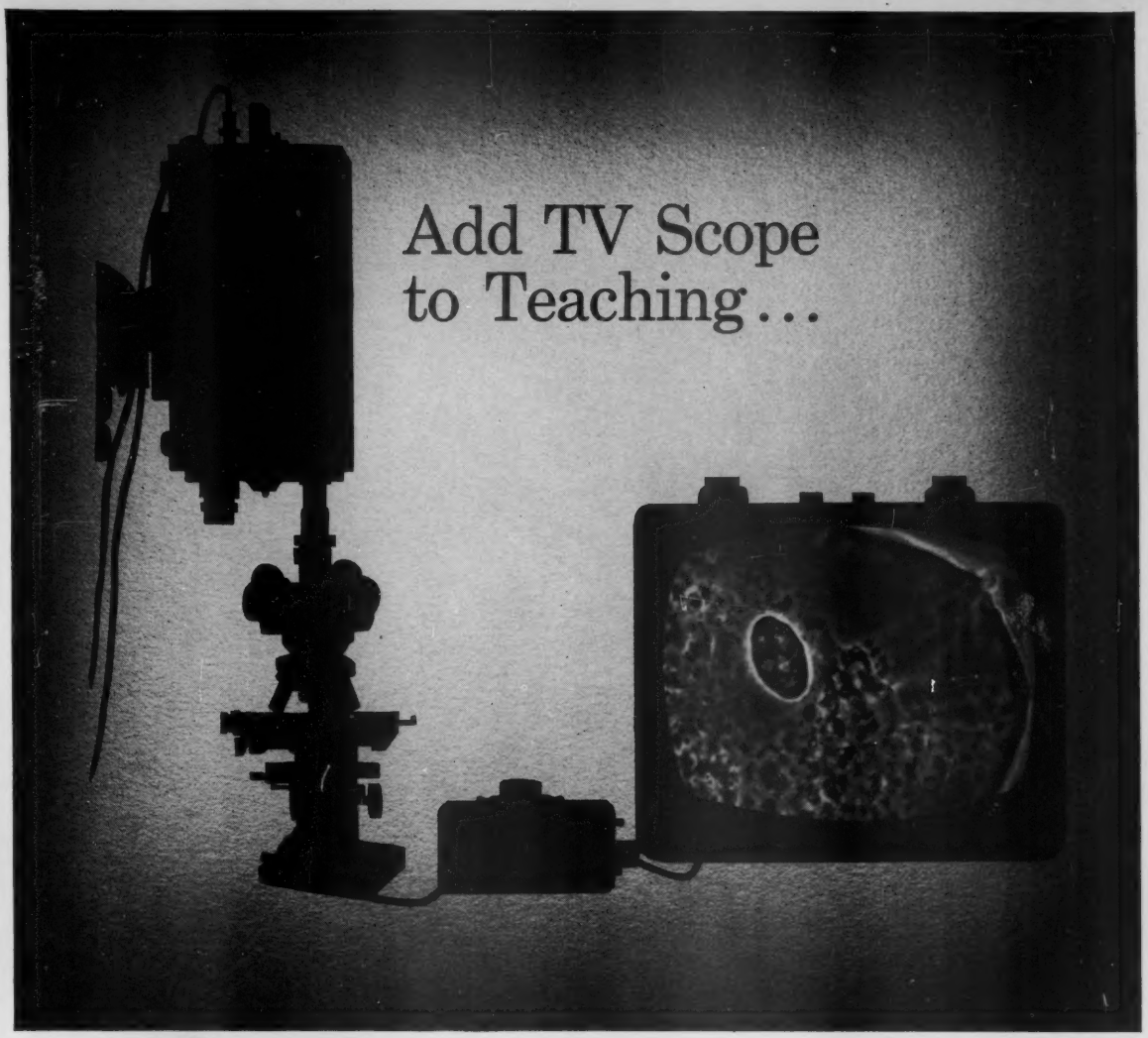

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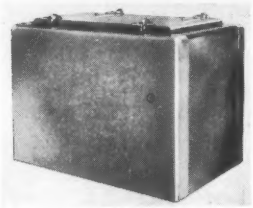

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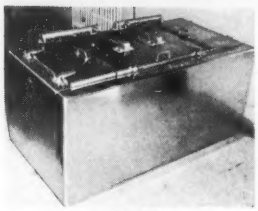

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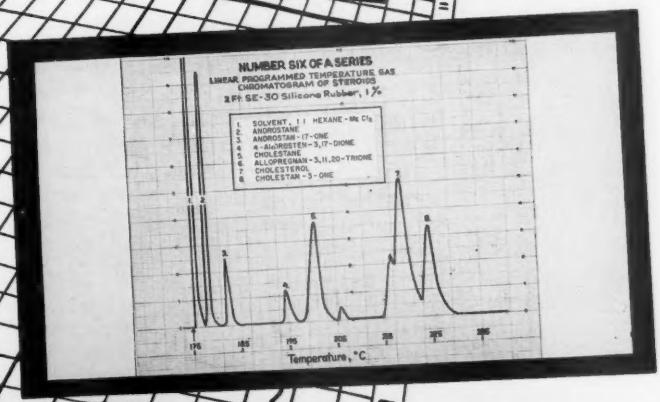
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LITERATURE CITED

(1.) Beerthuis, R. K., and Recourt, J. H., *Nature*, 186, 372-374 (1960).

(2.) *Martin, A. J., Euston, C. B., and Martinez, F. W., Jr., "The Design and Evaluation of a Linear Programmed Temperature Gas Chromatograph Featuring a Hydrogen Flame Ionization Detector," presented at the Detroit Anachem Conference, October 1960.

(3.) VandenHeuvel, W. J. A., and Horning, E. C., *Biochem. Biophys. Research Commun.*, 3, 356-360 (1960).

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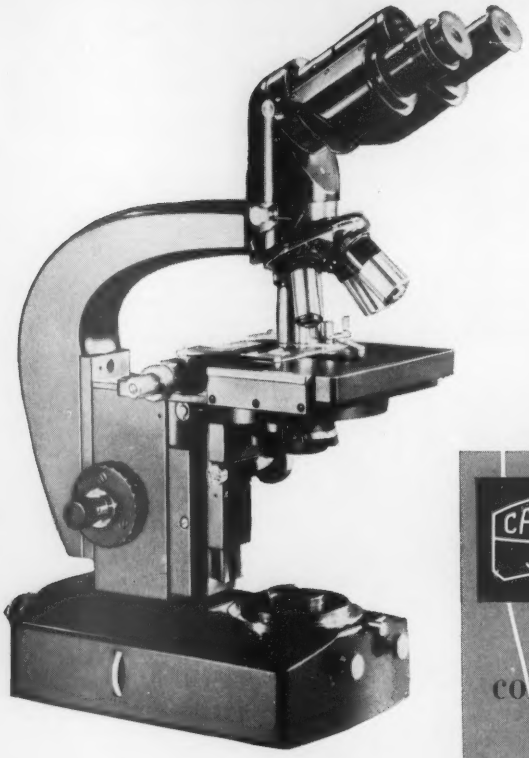

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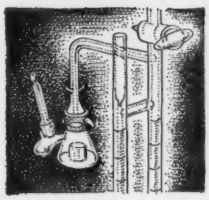

IN FEBRUARY—(1914)—investigation of the chemical structure of nucleic acids continues. Two years ago, Walter Jones (Johns Hopkins) reported the formation of guanylic acid from the hydrolytic action of pig pancreas on yeast nucleic acid, but this experiment "can be repeated with only occasional success...." By substituting Lebedew's commercial yeast for pig pancreas, Jones and Richards have now developed a procedure "which involves no judgment on the part of the experimentor." Since by this new method, guanylic acid is invariably obtained as an end product, it is definitely a constituent of yeast nucleic acid.[1]

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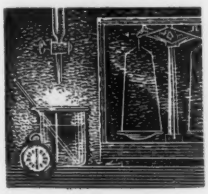

IN FEBRUARY—(1934)—a famous physical chemist writes about the effects of heavy water upon tobacco seeds, yeasts, molds, flatworms and mice.[2] G. N. Lewis finds that heavy water is tolerated in high concentrations by the lower organisms, but the rate of vital processes appears to vary inversely with the percentage of H^2. This is not surprising, since substitution of H^2 for H^1 reduces the rate of *all* physico-chemical processes.

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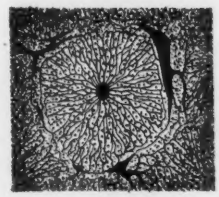

IN FEBRUARY—(1950)—Sanadi and Greenberg[3] report on the metabolism of tyrosine and phenylalanine in experimental diabetes. These had previously been considered ketogenic substances since they increase ketonuria in phlorhizinized animals and produce acetoacetate when incubated with liver slices. However, when the authors administered C^{14}-labelled phenylalanine and tyrosine to phlorhizinized rats, both the urinary glucose and ketone bodies were found to contain radioactivity. Therefore, the two amino acids should be considered *glycogenic* as well as *ketogenic.*

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1. Jones, W., and Richards, A. E.: The partial enzymatic hydrolysis of yeast nucleic acid. J. Biol. Chem. *17*:71 (Feb.) 1914. 2. Lewis, G. N.: The biology of heavy water. Science *79*:151 (Feb. 16) 1934. 3. Sanadi, D. R. and Greenberg, D. M.: Metabolism of C^{14}-labelled tyrosine and phenylalanine in phlorhizinized rats. Arch. Biochem. *25*:257 (Feb.) 1950.

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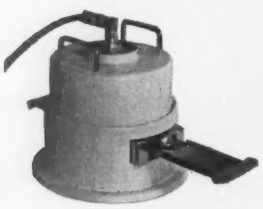

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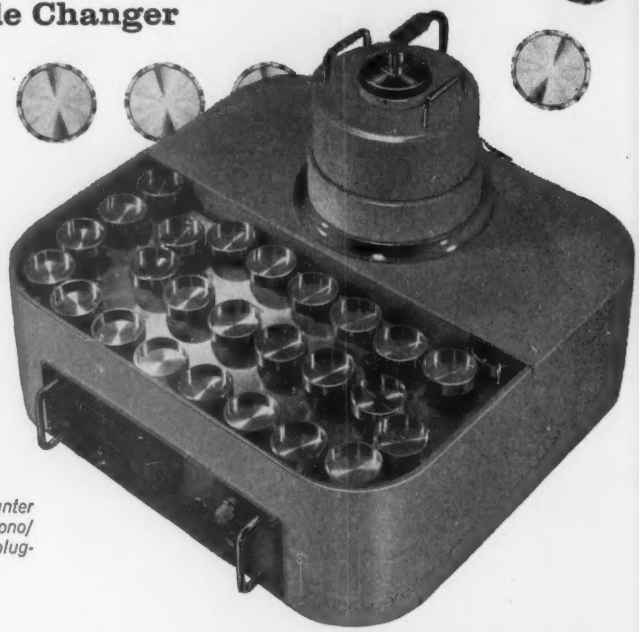

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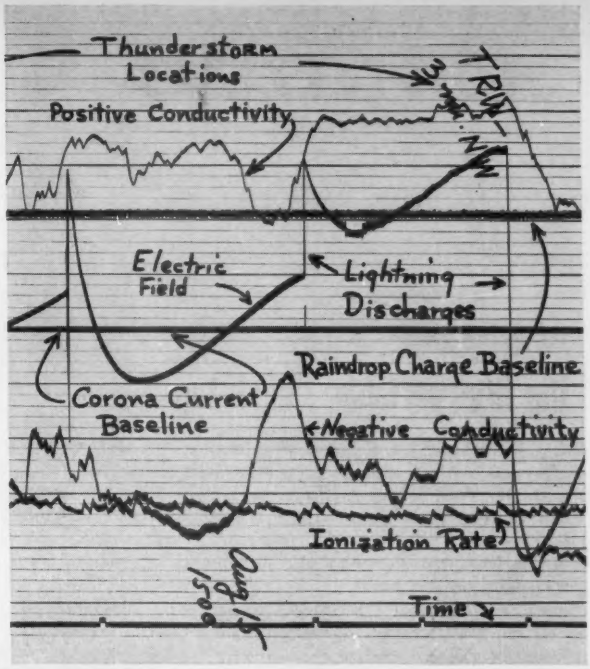

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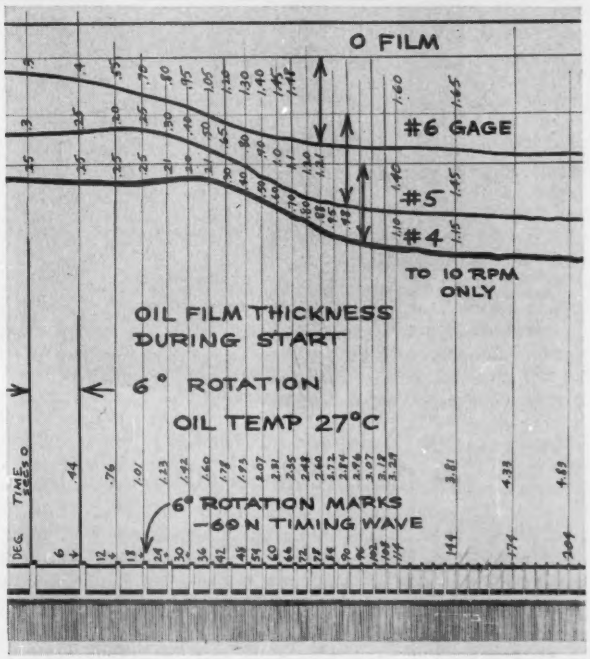

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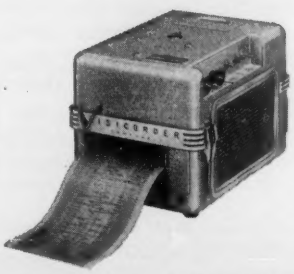

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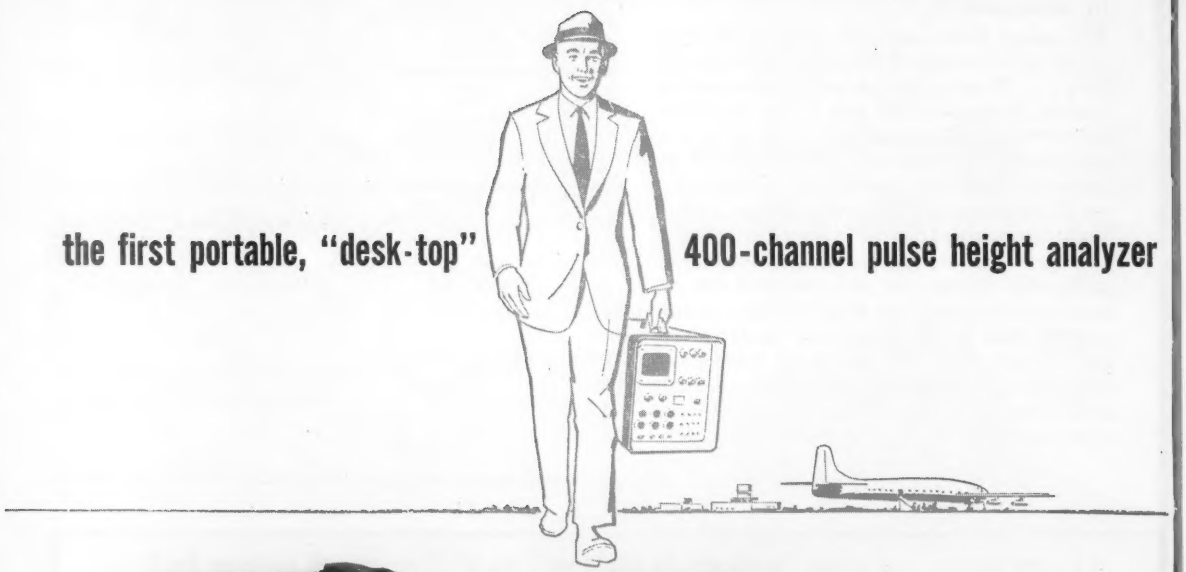

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A Question of Degrees

The degree of doctor of philosophy was awarded for the first time in this country by Yale University 100 years ago tomorrow. It was modeled after the German Ph.D. and was designed to be the highest earned academic degree and to certify mastery of a subject-matter field and the performance of original research.

The degree is now well established, and it is one of the best known of the 1600 different degrees currently awarded. But this was not always so: in its early days the high prestige of the degree led some universities and colleges to begin awarding it as an honorary degree, a practice that blurred its significance as an earned degree with a research requirement. The number of honorary Ph.D.'s steadily increased and reached a peak of 50 in 1889. Even by 1881 the abuse had become so flagrant that the American Philological Association passed a resolution, concurred in by the AAAS, which deprecated "the removal of this degree from the class to which it belongs . . . and its transfer to the class of honorary degrees." By 1896 the organization of graduate schools (Federation of Graduate Clubs) resolved that "the degrees of Ph.D., Sc.D., M.D. and Pd.D. should never be given *honoris causa* or in absentia." Despite this caveat and others, the number of honorary Ph.D.'s showed no rapid decline; there were 23 in 1900, 35 in 1901, and 20 in 1907.

The battle to maintain the integrity of the degree was won—or nearly won—as a consequence of the academic outcry that arose when Gonzaga University conferred an honorary Ph.D. on Harry L. (Bing) Crosby in 1937. Few institutions have had the temerity to award one since.

The number of earned doctorates (and from 1920 on this includes the degree of Doctor of Education) has shown a continuous increase. About 177,000 were awarded between 1861 and 1960. In 1920, the number was 615; in 1930, 2299; in 1940, 3290; in 1950, 6633; and in 1960, more than 10,000 (the compilation of figures is not yet complete).

So much for statistics; but what do you call a Ph.D. to his face, Mister or Doctor? Everyone knows that a surgeon is called "Mister" in England, but that physicians are called "Doctor" both socially and professionally in the U.S. The British novelist Pamela Hansford Johnson, in an article entitled "It's Easy to Get Americans All Wrong," in the *New York Times Book Review* on 1 January, confesses her bafflement about academic titles. "In America, the usage seems to vary from campus to campus. On some, 'Professor X' or 'Doctor' gives way to the over-all 'Mister'. On others, the title is used, and is expected to be used. How shall a foreigner . . . get these things right?" The confusion is not confined to foreigners. In some universities the administrators call all Ph.D.'s "Mister," but students and colleagues call them "Doctor." Often, but not always, Ph.D.'s are "Misters" socially. In industry and government, both socially and professionally, they are "Doctors," as they are also in the pages of the *New Yorker*, *Time*, the *Saturday Review*, and the New York *Times*. The Washington *Post* reserves the title for those in the health fields, but occasionally slips up on Dr. Wernher von Braun and Dr. George Gallup.

We hope this brief essay will add nothing to the confusion of either natives or foreigners. Doubtless during the next century the number of Ph.D.'s will continue to increase, and some stabilization in the form of address will occur.—G.DuS.

[The information given above was derived largely from *Academic Degrees*, by W. C. Eells and H. A. Haswell (U.S. Government Printing Office, 1960), and *American Universities and Colleges*, Mary Irwin, Ed. (American Council on Education, ed. 8, 1960). The figures for 1960 were supplied by L. R. Harmon of the National Academy of Sciences–National Research Council.]

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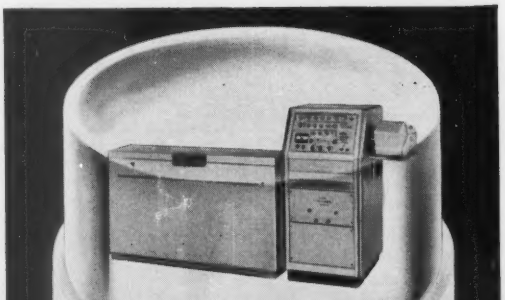

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INSTRUMENTS AND TECHNIQUES

Electromagnetic Radiation as a Tool in the Life Sciences

Radio waves, long used for communications, are becoming an important tool in biophysics research.

Tom Jaski and Charles Süsskind

Although certain types of radiation, notably ultraviolet and x-radiation, have long been used in altering the life cycle, the physical and chemical structure, and the reproductive processes of biological organisms, much less attention has been paid by researchers in the life sciences to electromagnetic radiation at lower frequencies. Yet it now appears likely that the use of this type of radiation may provide new approaches to hitherto unsolved problems and may eventually contribute toward the understanding of life processes.

Considerable attention has been given at recent scientific conferences to the biological effects of microwave radiation, as used in communications and in radar. Several papers on this topic were presented at the 12th Annual Conference on Electrical Techniques in Medicine and Biology, in Philadelphia, the 3rd International Conference on Medical Electronics, in London, and the 4th Tri-Service Conference on the Biological Effects of Microwave Radiation, in New York, all held within the past year.

The reason for the increased interest in these radiations is the much expanded application of microwaves in industry and for military purposes. The military services have been interested for some time in possible harmful effects of microwaves (*1–4*), partly because of a genuine concern for the safety of personnel and partly as the result of unfavorable publicity given to the matter by some of the less conscientious mass-communication media. An academic rather than an industrial and military approach to the subject has resulted in a great deal of interest, on the part of university researchers assigned hazard investigations, in the possibilities of the radiations as a scientific tool.

Radio waves have been used for many years in medicine as a therapeutic technique called "diathermy." However, diathermy applications and experiments have proceeded primarily on an empirical basis. A more quantitative approach was required for the use of radio waves in physics and chemistry, where they have been utilized for radio spectroscopy in its various forms and in other ways. More recently, direct radiation under precise quantitative control has been applied to the determination of important biological parameters.

Although there is no fundamental difference in the radiation from various parts of the electromagnetic spectrum, including visible light and x-rays, the various radiations affect living organisms quite differently. The action of x-rays, for example, is primarily ionization, a process that requires energy of the order of several electron volts. The energy E associated with electromagnetic radiation is proportional to the frequency ν, and its value ($E = k\nu$, where k is a constant) is sufficiently high to produce ionization at the frequency of x-rays and in the ultraviolet and visible portion of the spectrum. At the much lower radio frequencies and in the microwave range the energy is much too low to produce ionization. There, the principal effect is one of heating, due to the resistance to the electromagnetic wave passing through a "lossy" dielectric; we speak of "nonionizing" radiation. However, there is reason to believe that nonionizing effects other than heating are involved. An increasing amount of current research is being devoted to these athermal effects of radio waves.

Medical Therapy and Research

The biophysical basis for experiments with alternating currents on human beings was formulated by Nernst (*5*). He showed that the conduction of high-frequency electric currents is made possible by the motion of ions in an alternating-current field. Next, von Zeyneck in 1908 grasped the possibilities inherent in heating body tissues by the conduction of a high-frequency current through them, a therapeutic method for which he coined the name *diathermy* (*5*). His technique was to apply electrodes directly to the skin of the body—a rather ineffective method, since the various tissues have markedly different ohmic resistance, so that the heating was not very uniform. As the frequencies available increased with technological advances, it became apparent that generation of heat in tissues depends on frequency.

Beginning in 1928, Schliephake (*5*) employed higher frequencies (approxi-

The authors are engaged in a project sponsored by the U.S. Air Force at the Electronics Research Laboratory, University of California, Berkeley. Dr. Süsskind, associate professor of electrical engineering, is director of the project.

mately 30 megacycles) for therapeutic experiments. At these higher frequencies, the predominant effect was one of induction rather than conduction, and a much more uniform depth penetration could be achieved. It became possible to heat the deeper layers without overheating the skin and the subcutaneous tissues. Broadly speaking, penetration increases with frequency; future diathermy equipment may operate in the same high range as certain radar transmitters, at frequencies of several thousand megacycles.

The history of the use of radio waves reveals many attempts to employ them experimentally for the generation and investigation of poorly understood phenomena. The methods employed by some of these early researchers were, to say the least, of somewhat doubtful validity; so were some of the conclusions they drew from their results. Yet these investigators deserve mention because of renewed interest in the type of experimentation which they undertook, some of which is being repeated with modern methods, under carefully controlled conditions.

For example, the Italian physician Cazzamalli attempted in the 1920's to elicit heterodyned radiation from human brains by exposing them in vivo to the field of a relatively powerful radio transmitter (*6*). He claimed to have observed and recorded a variation in such radiation when his hapless subjects were emotionally aroused or engaged in creative pursuits. Among his results was the finding that hallucinations could be induced in highly suggestible individuals by radiation.

Even less acceptable are the results reported by the French physician Lakhowski (*7*), who believed that multifrequency radiation introduced in the vicinity of his subjects was responsible for their recovery from malignant growths, and who concluded that this type of radiation contained the key to the secret of life. This thought forms the central theme of the book reporting his observations; the volume is a curious mixture of apparently incontrovertible testimonies of successful cures and near-mystical "theoretical" considerations.

Considerably more plausible are the results produced with microwave radiation by a Dutch physician, van Everdingen, a tireless and careful as well as persistent and imaginative researcher. He reported (*8*) the reduction of certain types of growths by carefully planned procedures that included injecting irradiated substances. The results included control of the appearance of growths in healthy animals exposed to time-tested coal-tar stimulants and the induction of growths by the reversal of certain steps in his procedure. Van Everdingen observed that microwaves affected the heart action of the chicken embryos and that this effect did not occur until glycogen first appeared in the affected hearts. He concluded that some action on the glycogen was responsible for the result. Further experimentation revealed that the microwaves produced a measurable change in the plane of optical polarization in the glycogen if the concentration and viscosity of the substance were precisely controlled. The amount by which the polarization plane was rotated proved to be an accurate indicator of dosage at a given frequency. Van Everdingen concluded that it was this kind of "unnatural" mechanism that controlled tumor growth. Extracts from the livers of healthy mice, when irradiated, would affect the resistance to tumor growth of mice injected with the altered substance.

We have been unable to determine any specific results of extensions of van Everdingen's work to experiments with human patients. But only last August Bach reported (*4*) that the U.S. Army Medical Research Laboratory at Fort Knox, Ky., was engaged in extending some of these early experiments.

Numerous other experiments have been performed to study the effect (other than heating) of radio waves on biological specimens. As an example, Nyrop (*9*) reported specific effects on bacteria, viruses, and tissue cultures resulting from experiments in which heating was carefully excluded by applying the radiation in short pulses, with intervals long enough (and increasing as the experiment progressed) to prevent the temperature from increasing. Although experiments of this sort have elicited considerable skepticism in the past (*10*), more recent results, described below, suggest that a physical basis may indeed exist for some of the earlier observations.

Another aspect that has attracted attention in scientific circles both in this country and in the Soviet Union is the possible neurological effect of electromagnetic radiation. The much-publicized rhesus-monkey experiments performed at the U.S. National Institute for Neurological Diseases (*3*) fall in this category, as do the experiments on isolated nerves performed at Tulane University and reported by McAffee (*3*). Owing to the relatively high power levels employed in McAffee's experiments, it is very likely that most of the effects observed are related to the stimulation of nerve fibers by heating.

In the Soviet Union, interest in this aspect of electromagnetic radiation has been very high; one Soviet review article (*11*) cites many results that cannot be dismissed as thermal effects. At the London conference last summer the Soviet scientist Gordon reported (*12*) that after irradiation with microwaves at a low level, the delay between stimulus and conditioned reflex in dogs increased, and the employment of a larger stimulus became necessary. Moreover, histological examinations of brain tissues revealed physiological and chemical changes such as globular concentrations of acetylcholine along nerve fibers.

Microwave and Radio-frequency Spectroscopy

Radio waves have been extensively used in chemistry in spectroscopy. Three categories of radio spectroscopy may be distinguished: transmission spectroscopy and two forms of magnetic resonance—nuclear magnetic resonance and electron paramagnetic resonance. In transmission spectroscopy, the techniques of light spectroscopy (that is, the classification of the content of a sample through the identification of specific absorption bands) are extended to a range of lower frequencies, where measurements of molecular rotational energy levels can be made with extremely high resolutions and sensitivities. In nuclear magnetic resonance the precession of the spinning nuclei of atoms of the materials under investigation is affected by the simultaneous application of a radio-frequency electromagnetic and a direct-current magnetic field. (Either the frequency of the electromagnetic field or the strength of the magnetic field must be varied.) At specific frequencies and field strengths characteristic of the elements in the substance, energy is absorbed, because of the realignment of the nuclear spins. Upon relaxation of the fields, this energy is released and detected by a radio receiver. In electron paramagnetic resonance, electrons rather than nuclei are affected; because the precession rate is much faster, microwave frequencies must be employed in electron paramag-

netic resonance, whereas much lower frequencies are used for nuclear magnetic resonance.

The field of spectroscopy below infrared frequencies has given rise to an entire new branch of chemistry and has been the subject of several exhaustive treatments (*13*). Of particular importance is the recently developed electron-paramagnetic-resonance technique for observing the formation of free radicals, the formerly theoretical intermediate products of chemical reactions. Although all of the techniques decribed above utilize electromagnetic radiation as a tool in the study of chemical substances, many of them of biological interest, it is not the intention of the investigators to change the substances under study through the measurement procedure.

Physical Chemistry

In addition to the use of radio waves for the passive study of compounds, attempts have been made to employ such waves for the purpose of changing the structural arrangement of substances such as proteins and enzyme systems. Beginning in the 1930's, de Pereira Forjaz (*14*) investigated the rate of reaction of chemical systems under irradiation by ultrashort waves and found a substantial acceleration. More recently, Gilkerson (*15*) has utilized this phenomenon for the measurement of the rates of extremely fast ionic reactions in solutions.

Lepeschkin (*16*) investigated differences in changes in the molecular weights of constituents of human blood serum when it was heated and when it was irradiated by microwaves. He found that he could bring about more stable alterations in the substances by microwave radiation than he could by heating. Fleming (*17*) observed a difference in bacterial growth according to whether the sample was irradiated with electromagnetic irradiation or with heat, and discovered a frequency and power dependence.

Other phenomena that have been studied by means of electromagnetic radiation have to do with the detailed nature of aqueous solutions. The electrical charges associated with water molecules are disordered. Under the action of an electromagnetic field, these randomly oriented charges tend to line up (and the molecules with them). As the frequency of the alternating electromagnetic field is increased, the charge reorientations have difficulty in following the rapid variations. As in radio spectroscopy, it is this frequency dependence that can be utilized to yield information about the structure of aqueous solutions of biologically important molecules. The details of the techniques employed must be modified to take into account the fact that at microwave frequencies water absorbs electromagnetic energy rather strongly and resonance lines of individual molecules cannot be readily resolved. However, these structural details can be inferred from measurements of bulk properties such as the dielectric constant and conductivity, for which measurements microwave techniques are very well suited (*10*, *18*).

As an example, Buchanan *et al.* (*19*) have shown that microwave measurements can be used to estimate the

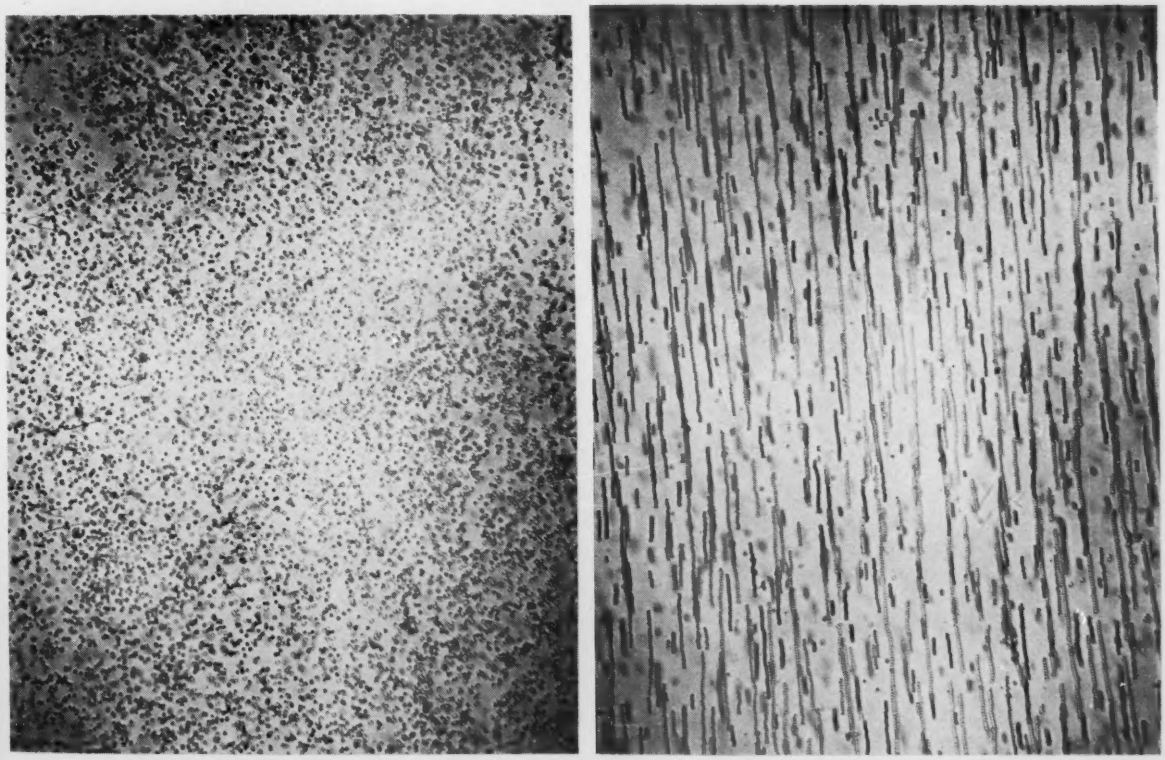

Fig. 1. Polystyrene spherules 1.171 microns in diameter suspended in water (left) at random, and (right) forming "pearl chains" under the action of an electromagnetic field (26 megacycles). [Courtesy Dr. J. H. Heller, New England Institute for Medical Research]

maximum amount of chemically bound water in proteins. The precise amount of bound water is of vital importance in determination of the weight and size of a protein molecule, and these, in turn, are among the fundamental data required in many biological investigations.

Dielectric and conductivity measurements have also been used by Schwan (*18*) to yield information about the nature of a cell membrane, its composition, and the composition of the cell interior. This investigation represents one of the most spectacular instances of the use of high-frequency electromagnetic radiation for obtaining new results in biology.

Saito and Schwan have recently reported (*4*) another instance of the use of dielectric theory, to explain the phenomenon of "pearl-chain" formation observed by previous investigators (*20*). Like molecules, microscopic particles in suspension tend to align (Fig. 1) under the influence of an electromagnetic field; the ordering influence depends on the frequency and strength of the electromagnetic field. A similar phenomenon is observed with ellipsoidal motile microorganisms (Fig. 2), whose motion under the action of an electromagnetic field tends to be either in the direction of the lines of force or at right angles to them, depending on the frequency (*21*). Saito and Schwan's theory may account for these observations on the basis of an extension of dielectric theory to suspensions of microscopic particles.

Applicability to Research Problem

A difficult problem that faces an experimenter unfamiliar with electrical instrumentation techniques, and one in which precedent is of least value, is that of deciding whether irradiation with some form of electromagnetic energy is at all applicable to the research at hand. Where the interest centers around a method of uniformly heating an object or biological entity very rapidly, radiation in the microwave region is probably the most effective method. Where surface heating without the use of flame or other energy-transfer media is desirable, ultrahigh-frequency radio waves are more likely to be satisfactory. But where nonthermal phenomena may have to be evoked, a pilot study should definitely precede a full-scale investigation, to indicate whether or not the approach can be expected to be a fruitful one.

Radiation "Hazard" Problem and Dosimetry

With the general acceptance of a safe level for whole-body microwave irradiation, interest in the "hazard" aspect of electromagnetic radiation has somewhat decreased. For continuous whole-body irradiation, this level has been set (*10*, *22*) at 0.010 watt per square centimeter—a power density that can be quite reliably detected by commercially available radio equipment if the frequency is known beforehand, and yet one that is several times smaller than any value known to yield any physiological indication. Several relatively minor aspects of the hazard problem, still under investigation, may well result in revision of the safe-dosage level by a factor of 2 under varying conditions related to frequency, duration, orientation with respect to the electromagnetic field, and allied considerations; but the interest of the principal investigators has largely reverted to possible uses in pure research.

The history of our own project at the University of California (*23*) has been fairly typical of work in similar laboratories throughout the country. Starting with an effort to establish a significant irradiation level for a study of longev-

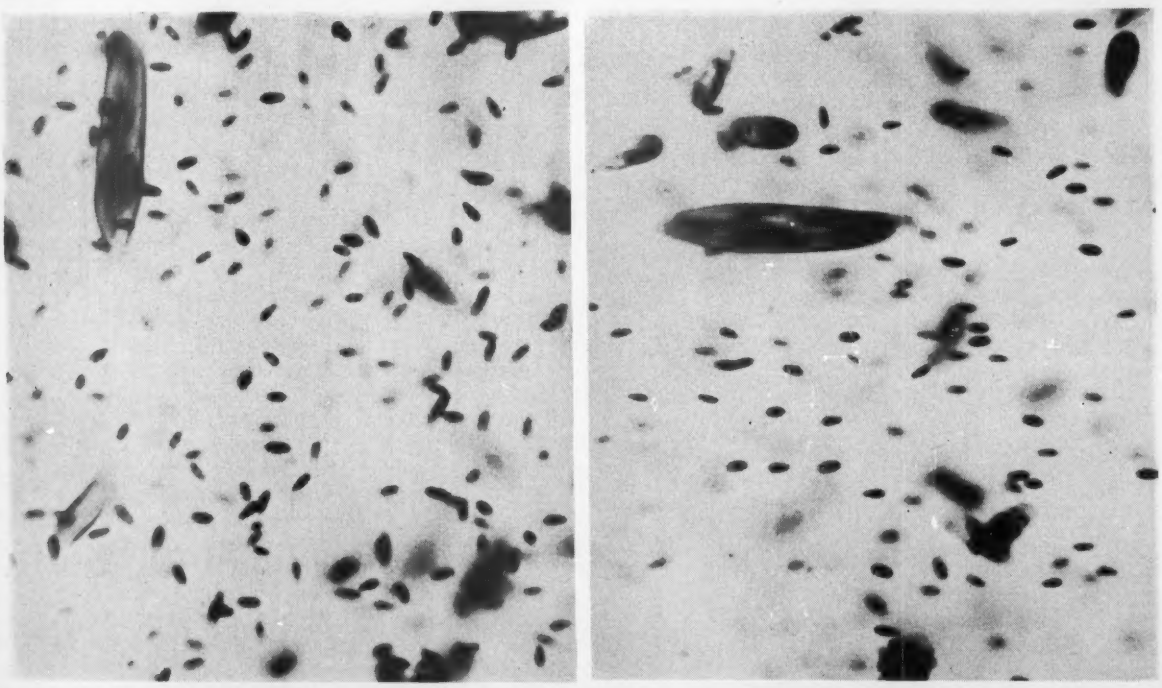

Fig. 2. Ciliates (left) moving at random, and (right) under the influence of an electromagnetic field (100 10-microsecond pulses per second, at 6 megacycles), moving parallel to the lines of force. Above a certain frequency, the direction of motion changes by 90°. The larger organisms are paramecia. [Courtesy Dr. J. H. Heller, New England Institute for Medical Research]

ity in a large colony of mice exposed to a 3-centimeter U.S. Air Force radar, we accumulated some data in the process of precise calibration that may prove to be of interest to workers in a number of fields, ranging from antenna design to zoology. The laboratory (among the first to utilize the radiation-as-tool approach) next demonstrated how microwaves could be used, for instance, for the study of thermal balance in mammals (*24*). The daily irradiations of the experimental colony of mice below lethal levels continue. The investigators have also had time to study such aspects of the problem as the effect of "fractional" on-off irradiation, simulating exposure to a rotating radar antenna. However, an increasing proportion of their effort is being devoted to basic investigations.

As a result of such investigations at a number of universities, the safety level remains at 0.010 watt per square centimeter. An obvious sort of hazard exists in the case of a person entering a field in which the power density is above the safe level without being aware of it. In areas where electromagnetic radiation is likely to be present, all personnel should be equipped with some sort of indicator comparable to the survey meters used by workers subject to danger from ionizing irradiation. Several manufacturers have developed radiation meters for use at microwave frequencies; these meters are becoming available commercially.

However, the problem of dosimetry is not a simple one. Radiation at a given frequency can be readily measured, but the equipment usable at one frequency is rarely suitable for another frequency. Power density alone is not a sufficient indicator; the effect of the energy absorbed by a subject may vary a great deal, depending on his absorption and reflection characteristics and on ambient conditions (*25*). Moreover, power-density measurements do not really show the "dosage" received, since they are in no way indicative of the actual physiological effects. "Dosimeters" based on absorption have been proposed; one version, described by Richardson (*2*, *3*), would employ a quantity of a gelatin-like substance simulating the properties of human tissue and a temperature-sensing device to produce an electrical signal, capable of being amplified, that is proportional to the total heating. Such a device would not be very sensitive to frequency and could be employed in situations where instruments of several frequencies might be radiating simultaneously, as on warships. But it has been found difficult to make the device wholly independent of its environment.

It is probable that ordinary intensity meters, one for each possible frequency of radiation in a given situation, will continue to satisfy most safety requirements. Such meters can be arranged to serve as warning devices, producing an audible signal whenever the radiation exceeds the safe level. But no matter which of these schemes is employed, there is little doubt that nonionizing radiation, handled with quite minimal safety precautions, presents no greater hazard than ordinary electric current or x-radiation from unshielded high-voltage electronic devices such as the very klystrons or other tubes that produce the supposedly hazardous high-power electromagnetic radiation. In fact, what we have tried to show is that, instead of considering electromagnetic radiation purely a hazard, from the biological viewpoint, research workers have become increasingly conscious of the growing importance of such radiation as a tool in the life sciences (*26*).

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Science in the News

The Missile Gap; Overhead for Federal Research Grants; Aid to Education and Civil Rights

The dispute over the missile gap, which could have substantial repercussions on national science policies, remains a matter of great confusion. The facts of the matter should become clearer after Senator Russell's Senate Armed Services Committee completes an investigation, scheduled to begin 20 February. (Both Houses of Congress have been pretty thoroughly demobilized until then, as is customary, to give Republican members a chance to get out of Washington and make Lincoln's Birthday speeches.)

Meanwhile there has been no indication of how the new estimates of the existence or nonexistence of a gap are going to affect the Administration's proposals for changes in the defense budget, due by 1 April, nor even of a generally agreed upon interpretation of exactly what Defense Secretary McNamara meant when he set the controversy off with a remark at a background briefing for reporters that the expected missile gap has not developed. Kennedy has been noncommittal, saying only that a study of the situation begun after the election would not be completed until the end of this month.

The term itself is used in two different senses: narrowly, to describe a Soviet lead in intercontinental missiles; more broadly, as a synonym for the deterrent gap, an over-all Soviet lead in strategic position. This gap, it has been feared, would put the Russians in a position to knock out the bulk of the American deterrent force by a surprise first strike, a possibility that has been causing great consternation here.

The existence of a substantial gap would open a hideous, unlikely, but nevertheless rational policy course to the Russians: to attack the United States in the belief that so much of the American retaliatory force could be knocked out in the first strike that the United States could not answer the attack by inflicting unacceptable damage on Russia. Indeed the Russians might calculate that the United States could not answer the attack at all, in the fear that an American retaliation against Russian cities would be suicidal, since the United States would now be defenseless against a second Russian strike at our cities. (The first strike, everyone assumes, would be aimed at missile and bomber bases, rather than at population centers.)

The concern has been not only about the possibility of a surprise attack. It was felt that the mere existence of such a gap, even if the worst was highly unlikely, would be bound to limit American freedom of action generally. It was senseless, Eisenhower's critics argued, to believe that the United States, with a gross national product twice that of Russia's, could not afford to avoid being put in such an unpleasant position.

The danger of a deterrent gap, assuming nothing was done to prevent it, was expected to develop in the early 1960's, when the United States would still be relying heavily on manned bombers, which must necessarily operate from bases which could be easily located and destroyed by a first strike, while the Russians would have an overwhelming lead in missiles. This led to proposals, echoed by Kennedy during the campaign, for crash programs to prevent the gap from developing.

To the extent that the gap has now been discounted there would be a tendency to downgrade the necessity for an airborne alert, for pushing missiles into production before engineers and scientists are satisfied that they will not be obsolete in a very few years, to put overtime crews into the work of hardening and dispersing missile sites.

All of this would be expensive and would be justified primarily to meet a short-term emergency. If a new evaluation makes such measures appear less necessary, somewhat more money would be available for longer range research and development projects. Beyond this, to the extent that increases in defense spending can be less than had been expected, the President will be in a stronger position in asking for more money for domestic programs, including science and education.

This problem of money priorities is not so much a problem within the Administration, which clearly feels the country can afford a federal budget and a tax bite a great deal bigger than it has now, and which, to stimulate the economy, would like substantial federal deficits for the next year or two. The money limitations come in sharply, though, when the Administration has to calculate how much spending it can get Congress to accept.

Everyone agrees that, if a vote were taken today, most of Kennedy's nondefense proposals would be defeated by the House of Representatives. This does not mean they will be defeated when they finally come to a vote, but it does mean that Kennedy will have a hard fight for almost every one of his nondefense proposals. To the extent that he has to ask for major increases in defense spending, the conservatives will be strengthened in their conviction that the country cannot afford major new domestic programs. But, as noted at the beginning, it remains extremely unclear how much of a change in thinking was indicated by the talk of a diminished missile gap that dominated the news last week.

Kennedy Program

The details of Kennedy's programs for science and education have begun to come to light as his special message on health was sent to Congress last Tuesday noon. In addition to the promised increases in the amount of spending, he has included recommendations along the lines of the December Science Advisory Committee report on Basic Research and Higher Education, aimed at providing schools receiving grants with fuller payment for the overhead costs the schools incur in accepting the grants.

In his farewell address Eisenhower warned of the danger of basic research being dominated by the government through its power over grants, but the Eisenhower budget asked for no changes in the grant procedures, which now intensify the federal influence by forcing schools to put their own money

into projects the government chooses to support.

Among the proposals of the Science Advisory Committee report were that the government should pay a share of the salaries of faculty members devoting their time to government projects; that grants should cover the full cost of overhead (rent, building maintenence, secretarial service, etc.) which can be properly charged to the government project; and that government grants to students should be accompanied by grants to the schools they attend, since the student's fees never cover the full cost to the school of the student's education.

The last two of these proposals showed up in the proposals of the health message. Kennedy proposed a scholarship program for medical schools which would grant each school a yearly scholarship fund amounting to $375 per student enrolled. The schools would then award the money among the neediest quarter of its students, with a maximum yearly grant of $2000. But the scholarship fund would be accompanied by a grant to the school itself of $1000 per scholarship student. Thus, following the recommendations of the Advisory Committee, each student scholarship, averaging $1500, would be accompanied by a $1000 grant to the school to help cover the costs the school incurs beyond the fees charged to the student. The message also proposed an expanded grant program to encourage the schools to increase their facilities to accommodate more students.

On the matter of overhead costs on research grants, the health message included a proposal to raise the current 15 percent limit on the proportion of National Institutes of Health grants that can be awarded for overhead. Actual overhead costs run as high as 30 and 40 percent. Kennedy did not propose completely eliminating the restriction, only raising it to an as yet unspecified figure. But a raise from the current 15 percent to perhaps 25 percent might cost the government an extra $50 million a year to maintain the same level of research activity in the NIH program alone, and of course much more if the more liberal grants for overhead were to be made general throughout the government agencies. The message also recommended raising the budget of NIH, again by an unspecified amount, but presumably by enough to allow the institutes to maintain their planned level of project grants despite the extra overhead payments.

This problem comes up in another form in the practice by which some government agencies pay only part of the research costs of projects they choose to support. Here are excerpts from a statement by Father Hesburgh, president of the University of Notre Dame:

"Under present practice, universities are expected voluntarily to offer to contribute to each Atomic Energy Commission sponsored research program. Currently at Notre Dame, our research contribution ranges from 50 percent down to 11 percent of estimated yearly project costs. [In addition] . . . the university dedicates to nuclear research facilities, competent faculty, and promising students—all involving outlays of money and effort not compensated for in research contracts, even where a full overhead rate is allowed. . . . To shift the federal burden for research in the national interest to students, alumni, and benefactors of a private university not only forces compromise in the other educational objectives of the university, but also tends to defeat the public interest in improving higher education."

There is wide agreement with Hesburgh's point of view, as the Science Advisory Committee report suggests. As usual the problem comes down to not what people think should be done, but where to get the money to pay for it. But the small beginnings embodied in the health message suggest that Kennedy plans to move in this direction.

Aid to Education and Civil Rights

The Administration has still given little indication of what it intends to do in the touchy area of civil rights, an area which was tied to the problem of federal support for science and education by the report last month of the Civil Rights Commission recommending that the President cut off federal assistance to segregated public universities.

The most forceful argument of the commission, and there was no dissent, even from southern members, was that, particularly in the South, there is an enormous gap in quality between Negro and white schools which brings to the white schools far heavier support from the federal government and puts the government in the position of using public funds to widen the gap between the opportunities open to students of the two races.

In fiscal 1959, for example, the latest year for which figures are available, the National Science Foundation, the National Institutes of Health, and the Atomic Energy Commission made over $4 million in research grants to 16 white schools in seven southern states, while one grant of $797 went to a Negro school. Over-all, federal support for higher education in these states resulted in about $10 being spent for each white student for $1 spent for a Negro student. The total amount of federal support averaged about $200 per white student, $20 per Negro student.

Kennedy has made strong commitments on civil rights. Last week he appointed a liberal expert on the law of constitutional rights to his White House staff. There is little doubt that the President agrees with the commission's general finding that it would be morally and constitutionally correct for the federal government to cut off all support from public institutions with flagrantly discriminatory admission policies. There is equally little doubt that to do so would kill most of his program for education, for there is no way to win a majority in the House to support these measures without the aid of liberal southerners, none of whom could support the program if the Civil Rights Commission recommendations were in effect.

The situation is clearly understood by conservatives in both parties. It has led to the peculiar tactic, probably to be repeated in the current session of Congress, under which many conservative southerners leave the floor of the House when a segregation rider is proposed for an aid-to-education bill, thus helping to attach the rider, after which liberal southerners are forced to join their conservative colleagues in voting against the measure.

The result of the touchy political situation is that Kennedy seems to be trying to keep the entire area of strong executive action on civil rights reasonably quiet, probably until at least after Congress adjourns, while Charles Halleck, the conservative Republican leader of the House, has lately become the most outspoken supporter of civil rights on Capitol Hill. Congressman Adam Clayton Powell, now chairman of the House Education and Labor Committee, has announced that he probably would not propose his usual rider to the aid-to-education bill, barring aid to segregated schools, which prompted Halleck, always a supporter of the Powell amendment and an opponent of federal aid to education, to announce that he would propose Powell's amendment for him.—H.M.

News Notes

Venus-Bound Vehicle Launched from Sputnik; U.S. Restricts Satellite Data

The Soviet Union launched another spectacular earth satellite on 12 February. The satellite carried what is described as a "piggy-back" space ship, which was detached on command and sent toward the planet Venus. The official news agency Tass reported the launching when the Venus-bound 'interplanetary station" was already nearly 100,000 miles from the earth on its 3-month trip.

The announcement followed by 8 days word of the successful orbiting of the 7.1-ton Sputnik V. As in that case, very little information was released. The newest vehicle was described only as "heavy" and functioning normally, transmitting signals on command from earth on a frequency of 922.8 megacycles. The space ship, which carries a Soviet flag, weighs 1415 pounds and is expected to "reach the areas of the planet Venus in the second half of May." The object of the project, Tass said, is to determine more exactly the "size of the solar system and to carry out a program of physical observations in outer space."

U.S. to Release Fewer Satellite Data

The dearth of information emphasized the effects of a little-noticed administrative change made in November, which gave the National Aeronautics and Space Administration responsibility for issuing news on satellites. Heretofore, several Defense Department information units—Navy, Air Force, and so on—have issued tracking and other information directly. On the day before the launching of the Venus probe, Pentagon officials made it clear to newsmen not only that all satellite data would be released through NASA but also that the amount of such information—both United States and Soviet—would be greatly reduced from now on, including information about missiles.

Test-Ban Talks Postponed

Early this month the Soviet Union accepted the United States request for a 6-week postponement of the nuclear test-ban conference in Geneva. The 2-year-old talks, originally scheduled to start again on 7 February, will resume on 21 March; the new Administration requested the postponement so that it will have time to review the situation and develop new proposals. A special group under the supervision of President Kennedy's disarmament director, John J. McCloy, is studying the issues involved.

The Geneva conference of representatives of Great Britain, the Soviet Union, and the United States began in October 1958. A recess was called on 5 December 1960 when it became obvious that further progress was impossible until the new Administration was established.

UNESCO Science Program Has $10 Million Budget for 2 Years

Science projects sponsored by the United Nations Educational, Scientific, and Cultural Organization over the 2-year period 1961–62 will be financed by a $10 million budget. The over-all science plan was adopted by the eleventh session of the UNESCO General Conference in Paris in December. In addition to the plan for the upcoming 2 years, the program sets forth objectives for the next decade. The $10 million budget includes projects to be financed under the United Nations Special Fund and the Expanded Program of Technical Assistance.

The agency stresses that the "scientific plan of action" deals with problems of an urgent and universal nature. These include the tapping of new reserves to supplant waning natural resources, exploration and exploitation of the oceans, and utilization of science and technology to help industrialize the world's underdeveloped nations.

Among the major steps taken at the General Conference were approval of the creation of an Intergovernmental Oceanographic Commission to be located at UNESCO House (along with an active oceanography program), the setting up of a division of studies and research in natural resources, and the establishment of another new division to deal with university science teaching.

One of the most significant aspects of UNESCO's work in the natural sciences will be its collaboration in the International Indian Ocean Expedition, planned by the Special Committee on Oceanographic Research. This expedition will send 20 oceanographic vessels from 14 nations to investigate the world's least known and, at the same time, most important ocean—important in view of its effect on the hundreds of millions of people who live on its shores.

Research on Humid and Arid Areas

On land, the agency's program in the development of natural resources will include further investigation of such areas as the humid tropics and research on arid zones.

A research project which has been in operation in the dry belt that extends from North Africa to Southeast Asia is scheduled to come to an end in 1962, but its activities will be continued on a broader basis. In the coming 2 years, work will be centered on the study of underground water supplies in North Africa.

Among the problems which no single country can hope to solve are those of geology and seismology, UNESCO points out. Earthquakes have struck in recent years in the Middle East, North Africa, and South America, killing thousands and causing great damage.

While it is not yet possible to "predict" earthquakes, much can be done to reduce their toll through proper methods of construction and the mapping of areas where tremors are likely to occur. Under the program recently approved, UNESCO will send missions during the next 2 years to the Andes Mountains and to the Mediterranean.

A study of the earth's crust will also be made, under a plan to collect data on methods used in the search for natural resources. There will be, in addition, a long-term study of the soil itself.

Science and Industrialization

Another important aspect of UNESCO's science program concerns the role of science and technology in the industrialization of developing countries. The agency has been encouraged to go ahead with preparations for an international conference on this subject, to be organized during 1963 and 1964.

This conference would study the problems of rapid industrialization in the recent past in order to derive lessons for the future. It would attempt to learn how to transfer the achievements of industrialization from developed countries to agricultural countries without too abrupt a change.

Even before this conference is held, scientific aid is to be offered to new countries of tropical Africa, primarily

through helping them lay the foundations of organization, documentation, and teaching that will be required for any future national science program.

Coordination of Scientific Activities

Finally, approval has been given in Paris for continuation of the agency's efforts to coordinate the scientific activities of various nations. Toward this end, UNESCO has offered continuous help in the translating and abstracting of scientific papers and the setting up of new scientific organizations. The goal here is to keep international channels of science open.

Toward this same end, UNESCO supports a number of nongovernmental organizations, grouped largely in the International Council of Scientific Unions, which was instrumental in organizing the International Geophysical Year. In all, the agency will work with more than 85 international scientific unions and federations, thereby enlisting the cooperation of their 800,000 members.

All these aspects of UNESCO's science program for the next 2 years are in accordance with objectives set out in a "master plan," also adopted at the General Conference, which has listed priorities for the next 10 years. This plan was drawn up after completion of a survey on the main trends in scientific research, which was recently carried out pursuant to a resolution of the General Assembly.

Animal Disease Laboratory Nears Completion

The National Animal Disease Laboratory, located at Ames, Iowa, is nearing completion. This is a $16¼ million installation of the U.S. Department of Agriculture that has been under construction since July 1958.

Nearly all of the government's animal disease research will be concentrated in this laboratory, except for projects concerned with exotic diseases and with animal parasites and parasitisms. Work on the former will continue at the Plum Island Animal Disease Laboratory, located on a small island lying off the eastern tip of Long Island, N.Y., and work on the latter will be carried on at Beltsville, Md.

A large number of research workers will be transferred to Ames next spring and summer from a number of locations in the United States, but the greatest number will come from Beltsville, where all research on infectious diseases of animals will be closed down.

When fully staffed, the new laboratory will employ about 125 scientists and from 300 to 350 supporting staff members. A number of attractive positions will be available for bacteriologists, virologists, cytologists, immunologists, biochemists, and biophysicists. Generally speaking, only U.S. citizens will be able to qualify for appointments. All employees are appointed through the U.S. Civil Service, but examinations are not required; the qualifications of the applicants will be judged from their education and experience. Salary levels are commensurate with the qualifications of the individual.

Those interested in employment are invited to write to the laboratory's director, Dr. William A. Hagan, National Animal Disease Laboratory, Box 70, Ames, Iowa.

Translation Centers: 12 Countries Join Program at Delft; Bureau Founded by Biological Abstracts

Two major translation centers have been organized recently, one an international enterprise and the other a project of Biological Abstracts, Philadelphia. The first represents a new cooperative effort between the United States and a number of European countries to provide broader distribution among western nations of translations of scientific literature from the Soviet Union and other areas of Eastern Europe. The program was announced by John C. Green, director of the Office of Technical Services of the U.S. Department of Commerce.

A European Translation Center, sponsored by 12 member countries of the European Productivity Agency, has been established at the Technical University at Delft, the Netherlands. It will provide liaison among European countries handling such translations; serve as a center for bibliographic information on the availability of translations; and collect noncommercial translations from countries prepared to contribute them.

The Office of Technical Services, which is the U.S. Government's center for collecting and distributing translations and related information, is assisting the European Translation Center in establishing its procedures for bibliographic and other work. The OTS and the European Center will exchange translations and bibliographic data and will use uniform methods in classifying the materials. It is expected that the OTS publication, *Technical Translations*, will be used as the medium for announcing material collected at Delft; this should greatly increase the circulation of the publication in Europe. Green commented:

"The significance of this cooperative endeavor is that it reduces the language barrier for scientists and engineers of the United States and Western Europe who are trying to keep up with Soviet Bloc developments. In Western Europe, most scientists can read English translations of Russian work, and in the United States many of our scientists can handle translations of Soviet Bloc material in French or German or similar European languages. However, in both the United States and Western Europe scientists in general do not know the Soviet Bloc languages."

Since 1958 the Office of Technical Services has been collecting and distributing translations prepared by U.S. Government agencies for their own use. It also gathers and publishes information on translations, completed or in preparation, which are available from any other source in the United States, public or private. Among the translations for which OTS provides an announcement and reference service are those collected from nongovernment sources in the United States by the Special Libraries Association Translations Collection Center at the John Crerar Library in Chicago.

In cooperation with the SLA Center, the Office of Technical Services began publishing *Technical Translations* in January 1959 to announce translations available from OTS, SLA, and other sources. It is published twice a month and sold by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at $12 a year ($4 additional for foreign mailing).

The Europeans estimate that their contributions of bibliographic information to *Technical Translations* will increase by 10 to 15 percent the volume of listings in this publication in the first year of the European Center's operation, and that these contributions will eventually double the size of the publication. *Technical Translations* now announces about 500 new translations in each issue.

The Netherlands Government is providing financial support for the Euro-

pean Center. The center will operate under the legal authority of the Foundation for Scientific Literature Difficult of Access, of which L. J. Van der Wolk, director of the Library of the Technical University at Delft, is president. Formation of the center was fostered and encouraged by the European Productivity Agency of the Organization for European Economic Cooperation, with the advice and support of the U.S. National Science Foundation.

Biological Abstracts Opens Bureau

Simultaneously, Biological Abstracts has announced a program to increase greatly the amount of Soviet biological and medical information which it makes available to English-speaking scientists throughout the world. Through its newly founded Translation Bureau, Biological Abstracts will make and publish direct translations of selected abstracts from the Russians' own journal of abstracts, the *Referativnyi Zhurnal, Biologiya*. The project is made possible by equal grants, totaling $111,000, from the National Science Foundation and the National Institutes of Health.

By supervising the work in its own editorial offices, Biological Abstracts expects to provide scientifically accurate translation of the Soviet research material, to minimize the time lag, and, by lowering costs, to make greater numbers of significant abstracts available to non-Russian-speaking scientists. Cyrus C. Sturgis, Jr., who has had extensive experience in scientific translating and abstracting, has been appointed manager of the Translation Bureau. All of the translation will eventually be performed in the bureau itself, although initially some of it will be done by experienced outside agencies. During the first year, publication of 5000 translated abstracts from the Soviet literature is planned, and the figure will increase to 10,000 by 1963.

Other work of the Translation Bureau will include expansion of direct abstracting from the original Soviet journals and the establishment of a nucleus of translators of Chinese for greater coverage of the Chinese biomedical literature.

Biological Abstracts, which has offices in Philadelphia, is a nonprofit cooperative abstracting and indexing service organized in 1926 by a group of prominent biologists. Today the organization, which abstracts from more than 4900 primary journals, issues a semimonthly publication that is distributed to 97 countries.

News Briefs

UNESCO climate symposium. The UNESCO-World Meteorological Organization Symposium on Changes of Climate, with special reference to the arid zones, will be held in Rome, 2–7 October. One day will be devoted to each of the following subjects: (i) changes during the period of meteorological records; (ii) changes during the late geological and early historical record; (iii) theories of changes of climate; and (iv) significance of changes of climate.

Those who wish to present scientific papers are requested to send the title, together with a summary of not more than 250 words in English or French, to UNESCO's Department of Natural Sciences in Paris *not later than 1 March*. The full texts of all papers to be presented orally must reach UNESCO *before 1 May* in order to allow time for reproduction and distribution of the texts before the opening of the symposium.

* * *

Radiation biology course. Argonne National Laboratory is offering a special summer course in methods in radiation biology, to be held 26 June–21 July. The fee for the course will be $25. Inquiries and applications should be addressed to: Office of the Director, Division of Biological and Medical Research, Argonne National Laboratory, 9700 S. Cass Ave., Argonne, Ill. Only a limited number of applicants can be accepted; persons from foreign countries are invited to participate. Applications, which should be accompanied by a brief curriculum vita, must be received by 22 May.

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Army research unit transferred. The Army's Office of Ordnance Research at Durham, N.C., has been transferred to the command of the Army Chief of Research and Development. The office, redesignated the Army Research Office, will remain in Durham. With the transfer of command, the unit becomes the primary point of contact in the Department of the Army for those engaged in basic research in the physical sciences and in mathematics.

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Medical Association to aid students. In an attempt to alleviate the serious decline in the number and quality of applicants to medical schools, the American Medical Association's House of Delegates, at its recent meeting in Washington, D.C., unanimously approved a student honors program and a student loan program, drawn up by the Council on Medical Education and Hospitals. Both programs are designed to attract well-qualified students into the field of medicine. The loan program will provide long-term personal loans at moderate interest. The honors program will annually name about 250 outstanding college students as AMA scholars. Approximately 50 of those selected each year will receive grants of $1000 per year for 4 years, payable when they enter medical school.

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Zoology quarterly. The American Society of Zoologists has announced the establishment of its own quarterly, the *American Zoologist*. The managing editor is Sears Crowell of the department of zoology at Indiana University.

Two issues of the quarterly will carry the programs and abstracts of all papers presented at each of the two annual meetings, plus reports on official society business; the other two issues will carry papers presented at the symposia and at "refresher courses" sponsored by the society and, in addition, will publish occasional contributions of wide zoological interest. The quarterly will be distributed to all members of the society after payment of dues. Nonmembers may subscribe by writing to Crowell.

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Antarctic insects. Living insects and mites have been found at an elevation of 6000 feet above sea level about 90 miles from McMurdo Sound in Antarctica, the National Science Foundation reports. This is believed to be the highest altitude at which insect life has ever been found on the ice-covered continent. The organisms were found by Keith A. J. Wise, a New Zealander working for the Bernice P. Bishop Museum in Honolulu. Wise is one of four Bishop Museum scientists currently studying the distribution and dispersal of airborne and ground organisms, primarily insects, in the antarctic. The work is supported by a National Science Foundation grant.

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Russell Cave. The National Geographic Society has given Russell Cave in Alabama, the oldest known home of primitive man in the southeastern United States, to the federal government, to be administered as an archeological monument and national park by the Department of Interior. Excavations have shown that Stone-Age people inhabited the cavern, which opens into

the slope of a wooded cliff near Bridgeport, Ala., for more than 9000 years.

To preserve the cave for scientific study, the society purchased it and the surrounding 262-acre farm and, with the Smithsonian Institution, sponsored 3 years of excavation. Buried deposits of bones, tools, weapons, and ancient fires revealed a continuous record of the cave's occupants.

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Wildlife Week. The National Wildlife Federation, Washington, D.C., has begun distributing, to state and local chairmen, kits for the 1961 observance of National Wildlife Week, 19–25 March. The week-long annual program, directed by Russell J. Neugebauer, assistant chief of the Division of Conservation Education, always starts on the first day of spring. This year's theme will be "Multiple Use—Balanced Conservation Planning for the Future."

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Vietnam nutrition film. A documentary film has been prepared which illustrates the work of a United States nutrition survey team in Vietnam. The 36-minute color film with sound, "Nutrition Survey, Republic of Vietnam, 1959," was produced by the Interdepartmental Committee on Nutrition for National Defense, whose secretariat is located at the National Institutes of Health. The committee launched a nutrition survey program early in 1956 for the purpose of assisting developing countries, as part of the U.S. Mutual Assistance Program. The current release gives the story of the 12th nutrition survey.

The Vietnam film will be lent without charge to educational and professional groups interested in nutrition. Requests should be addressed to: The Executive Director, Interdepartmental Committee on Nutrition for National Defense, Building 16-A, National Institutes of Health, Bethesda 14, Md.

Grants, Fellowships, and Awards

Cancer. An international fellowship program backed by a grant of $250,000 from the Eleanor Roosevelt Cancer Foundation has been announced by the International Union Against Cancer. The program, which will be supervised by the IUAC, provides for a two-way system of fellowships for promising cancer researchers from the United States and other countries throughout the world.

The International Union Against Cancer is an international voluntary organization designed to provide coordination of efforts in research and control, including such broad programs as pooling and exchange of information and experience, development of standards and nomenclature, public education, and facilitation of the exchange of research workers. The International Union is supported by 51 member nations and is affiliated with the World Health Organization.

The fellowships will be available strictly on the basis of merit and qualifications, without regard to sex, race, color, or religion. For information, write: Office of Dr. Harold F. Dorn, General Secretary, International Union Against Cancer, National Institutes of Health, Bethesda 14, Md.

Tropical medicine. An intensive 2-month study of the research problems confronting medical scientists in the American subtropics is being offered by the Louisiana State University School of Medicine. Groups leave New Orleans in January, April, July, and October of each year. The program is open to teachers, research workers, and advanced Ph.D. candidates in parasitology, bacteriology, virology, mycology, medicine, pediatrics, public health, medical entomology, and medical statistics and in all areas of medicine, veterinary medicine, biology, or zoology dealing with disease transmission or with disease-producing organisms.

Travel and adequate subsistence funds are supplied through a training grant from the National Institute of Allergy and Infectious Diseases. Director of the program is W. W. Frye, dean of the university medical school. Inquiries should be directed to: George A. Thurber, Coordinator of Interamerican Programs, Louisiana State University School of Medicine, 1542 Tulane Ave., New Orleans 12, La.

Undergraduate research participation. College science majors from all over the country are invited to apply for the privilege to participate in advanced research projects to be conducted this coming summer by scientists of the American Museum of Natural History. The Undergraduate Research Participation Program, which was initiated by the museum in 1959, is supported by the National Science Foundation. Students may apply for work on one of 12 projects, in animal behavior studies, astronomy, mammalogy, ornithology, herpetology, living and fossil invertebrate research, and vegetation studies. Those selected will receive a stipend of $600, and certain maintenance and traveling allowances when field trips are involved.

Most of the projects will be conducted at the museum itself or at the museum's Kalbfleisch Field Research Station in Huntington, N.Y. A study of schooling behavior in fishes will be conducted at the Woods Hole Oceanographic Institute in Massachusetts. Application forms, which must be returned *by 15 March*, may be obtained from Dr. Evelyn Shaw, The American Museum of Natural History, 79th Street and Central Park West, New York 24, N.Y.

Scientists in the News

The New York Section of the American Association of Clinical Chemists has named **Samuel Natelson**, chief of the department of biochemistry at the Roosevelt Hospital, New York, as the recipient of its fifth annual Van Slyke Award. The award, a medal and honorarium, is sponsored jointly by the Standard Scientific Supply Corporation of New York City and the Ortho Research Foundation of Johnson & Johnson, Raritan, N.J.

The presentation will take place on 8 March, during a dinner at the Barbizon-Plaza Hotel in New York, to be followed by an award lecture on "The Impact of Progress in Clinical Chemistry on Infant Care." Those interested in attending the dinner should communicate with Dr. Bernard Klein, Veteran's Administration Hospital, Bronx, New York.

Samuel Natelson

Burrell Wood has joined the staff of Science Service, Washington, D.C., as editor of the monthly experimental publication kits and as assistant editor of the magazine *Chemistry*. Wood was formerly at the New Mexico Institute of Mining and Technology, Socorro, N.M., where he was professor of chemistry, admissions counselor, and assistant to the president.

Also at Science Service, **Leslie V. Watkins** has been made executive secretary of Science Clubs of America, succeeding **Dorothy Schriver**, who has been made assistant director for administration of Science Service and also continues as coordinator of the Westinghouse Science Talent Search. Miss Watkins came to Science Service from Roanoke, Va., with background experience of 13 years as a biology and physics teacher, science club sponsor, and active member of the junior and senior Virginia academies of science.

Kao Liang Chow, associate professor of physiology at the University of Chicago since 1954, has been appointed associate professor of medicine (neurohistochemistry) at the Stanford University School of Medicine. Also, **William van Bogaert Robertson**, formerly of the University of Vermont, has been named associate professor of biochemistry in the department of pediatrics. Robertson will direct the laboratories and the research program at the Stanford Convalescent Home. Both appointments became effective on 1 January.

Two other long-term appointments at Stanford have been announced.

Ellis N. Cohen has been appointed associate professor of anesthesia, starting 1 July. He is at present associate clinical professor of anesthesiology at the University of Minnesota. He has been chief of the department of anesthesiology at Charles T. Miller Hospital, St. Paul, since 1949.

Bruno Gerstl has been appointed associate professor of pathology, effective 1 September. He will be in charge of laboratory services in the Palo Alto Veterans Administration Hospital. Gerstl has been chief of laboratory service at Oakland Veterans Hospital and an assistant clinical professor of pathology at the University of California since 1947.

Louis J. Baume, chairman of the department of dental medicine at the University of Geneva, will deliver the second Mershon Memorial Lecture on "Principles of Cephalofacial Development Revealed by Experimental Biology," at the meeting of the American Association of Orthodontists on 17 April in Denver, Colo.

Rudolf L. Baer has been appointed chairman of the department of dermatology and syphilology at the New York University Medical Center, with which he has long been associated. In addition, he will serve as director of the dermatology and syphilology department at the New York University Hospital, including the Skin and Cancer Unit, and as visiting physician-in-charge of the dermatology and syphilology service at the Bellevue Hospital Center.

Lyman E. Fourt, assistant director of the Harris Research Laboratories, Washington, D.C., has been chosen as the 12th recipient of the Harold DeWitt Smith Memorial Medal, given by Committee D–13 of the American Society for Testing Materials. The medal, which is awarded annually for outstanding achievement in the science of textile fiber utilization, will be presented on 2 March at the Sheraton-Atlantic Hotel, New York, during the spring meeting of the committee.

The University of Michigan has announced that a number of faculty members will be on leave during the 1961–62 academic year.

David F. Bohr, professor of physiology, will take a sabbatical year to work in the laboratory of Hans Schaeffer of the University of Heidelberg. He will continue his study of single contracting muscle cells.

Minor J. Coon, professor of biological chemistry, will take a sabbatical year to work in the laboratory of Vladimir Prelog of the Technische Hochschule, Zurich, Switzerland.

Everett L. Ellis, associate professor of wood technology, has been granted half-time leave for the second semester of 1960–61 and the university year 1961–62 to permit him to serve as executive secretary of a special committee of the Society of Wood Science and Technology that is charged with conducting a study of educational needs in those areas. The study will be financed by the National Science Foundation.

Robert M. Haythornthwaite, professor of engineering science in the department of engineering mechanics, will be on leave during the second semester of 1960–61. He will devote the time to research and travel, with the University of Cambridge, England, as his base.

Floyd A. Peyton, professor of dentistry, is taking sabbatical leave from mid-January to mid-July to engage in research in countries of the Middle East, particularly in the United Arab Republic. The U.S. Department of State will help meet Peyton's travel and living expenses.

Jerome D. Schein has been appointed director of the Office of Psycho-Educational Research of Gallaudet College. He succeeds **Stephen P. Quigley**, who resigned to become executive secretary of the Sensory Disabilities Research Study Section of the U.S. Office of Vocational Rehabilitation. Schein has been affiliated with Gallaudet since last September, when he was appointed professor of psychology and clinical psychologist on the staff of the college's new Counseling Center for the Deaf.

William P. Jacobs of the biology department, Princeton University, is the new president of the Society for the Study of Development and Growth.

Anthony Ralston, manager of technical computing at the American Cyanamid Company, has been appointed an associate professor at Stevens Institute of Technology, where he will teach mathematics and take charge of the college's new high-speed computer.

William F. Talburt has been named director of the Rome, Italy, office of the U.S. Department of Agriculture's Foreign Research and Technical Programs Division. He was formerly assistant director of the Western Utilization Research and Development Division of USDA's Agricultural Research Service at Albany, Calif.

Talburt succeeds **Walter M. Scott**, an authority in the field of textile chemistry, who has been named assistant director of the Washington office of the Foreign Research and Technical Programs Division. He is former assistant administrator of utilization research in ARS and assistant chief of the Bureau of Agricultural and Industrial Chemistry.

After a 6-month leave devoted to writing and teaching, **W. C. Kelly** has resumed his post at the American Institute of Physics as director of education and editor of the newsletter.

Erratum: Thomas J. King is the head of the department of embryology at the Institute for Cancer Research, Philadelphia, not the former head, as reported in *Science* [133, 268 (27 Jan. 1961)].

Book Reviews

Emotion and Personality. vol. 1, *Psychological Aspects.* vol. 2, *Neurological and Psychological Aspects.* Magda B. Arnold. Columbia University Press, New York, 1960. xiv + 296 pp.; xvii + 430 pp. $7.50 each.

You may have reflected on the subtle retirement of William James from the psychological scene—James with his phenomenology and "test of reason," without the "rigor" of measurement, *t*-tests and *P*-values, information theory, cybernetics, or vacuum tubes. James's panoramic mixture of idealistic, realistic, and pragmatic philosophy, though quite possibly underbudgeted for sex, could, nevertheless, anticipate reverberating circuits and cell-assemblies (whatever value these may have in understanding the brain) without denigrating man. James is still very much alive. The scholarship, method, and rhetoric of Magda Arnold's volumes are Jamesian throughout.

Theorists ranging from theologians to physiologists have long pondered the causal relation between perceived object, emotional experience, and associated bodily changes. In general three main solutions have been advocated: that perception arouses emotion and then emotion causes bodily changes; that perception induces bodily changes which are felt directly as emotions; that perception arouses both emotion and bodily changes. Arnold offers a fourth solution to this classical problem. She holds the view (based upon a tightly reasoned argument) that emotions are aroused (experienced subjectively) not by perception directly but by an instantaneous appraisal of what we perceive; that emotion is a tendency to some sort of action appropriate to this appraisal, accompanied by a pattern of physiological alterations in body state.

Volume 1 presents a scholarly review and critical examination of past and present thought on the subject of emotions. It also educes a four-factor model: perception-appraisal-emotion-action based in part upon laboratory and clinical studies of human behavior. I sense some convergence in this model with recent laboratory analyses of thinking behavior in terms of phase sequences and other constructs. This is perhaps not surprising since the "same" brain subserves both cognition and conation.

Volume 2 examines the known physiological and neurological evidence and attempts to demonstrate that the theoretical formulation presented in volume 1 is consistent with and supported by such data. Here the argument is less than compelling. For example, emotion is a relatively prolonged state and there is little known neurophysiology to account for such states. Furthermore, the assumption is made, but not examined, that all modulating influences in the brain are reflected directly in neural transmission. Memory traces are heavily implicated in the appraisal aspect of the new theory and may or may not fit this assumption. Arnold suggests that the instantaneous appraisal is mediated by the "limbic system" of the brain, which is defined to include the subcallosal, cingulate, retrosplenial and hippocampal gyri (entorhinal cortex and adjacent presubiculum), and the island of Reil. The effects of selective ablation and of specific psychopharmacological agents on this system are examined in some detail.

Prologue to the Science of Emotion

It is noteworthy that Arnold addresses this communication to scientists. Walter Miles once told me of receiving a letter from Sigmund Freud expressing surprise that anyone would ever take his propositions to the laboratory for testing. Students of brain-behavior relations will welcome the departure from the theorists' usual procedure, which has been to start with neurological findings and speculate as to what these findings could mean. In the words of Arnold: "Such an approach overlooks the fact that we must know the exact sequence of psychological processes before we can identify the structures that mediate it." In any event, our *appraisal* of Arnold's theory must in important respects be quite different from the scientific assessment of its validity for brain functioning. These volumes represent a timely prologue to a science of emotion.

WARD C. HALSTEAD
University of Chicago

Smithsonian Treasury of Science. Webster P. True, Ed. Simon and Schuster, New York, 1960 (in cooperation with the Smithsonian Institution). xvi + 1208 pp. Illus. 3 vols., boxed, $15.

These volumes contain 50 essays on popular science, selected from the 3000 that have been published since 1846 in the *Annual Reports* of the Smithsonian Institution. The essays run the gamut of a century of science and of speculation about science, and for the most part they are well written and enticing, sober yet informative articles written for the intelligent layman. Whenever possible, with those articles that have been recently outdated, the editor has prevailed on the author or on another expert to provide a suitable addendum. For each essay, the editor has also added a short introductory note, explaining the essay's importance and saying something about the author.

However, all the addenda and pious introduction cannot conceal the fact that this is a rehashing job, hardly worthy of being enshrined in three volumes (boxed) and put out as a popular conspectus of the whole of science. Though it contains writings by Einstein, Pierre Curie, H. G. Wells, and Marconi, it is but an anthology from a noncommercial, scientific, annual publication, and few of its articles have the status of masterpieces of the art of science writing. They were not intended to be that. As Leonard Carmichael remarks in his introduction, the Smithsonian's function of the "diffusion of knowledge" has always been accomplished through its scientific publications; but only *to a limited extent* have its publications been directed towards the general public. The limited extent has always been well performed by the Smithsonian's own lights; no one

would be more delightful than I if the Smithsonian found it mete and proper to open a new and less-limited program of providing the authoritative yet readable popular articles demanded in this scientific age. Unhappily, these volumes are not a sign of the Smithsonian throwing its limitations to the winds; they are merely a regurgitation of the old style, and one must be disrespectful of Messrs. Simon and Schuster for aiding and abetting the process.

DEREK J. DE SOLLA PRICE
Department of the History of Science and Medicine, Yale University

Geologic Evolution of Europe. Roland Brinkmann. Translated from the German by John E. Sanders. Ferdinand Enke, Stuttgart; Hafner, New York, ed. 8 (condensed version of vol. 2), 1960. vi + 161 pp. Illus. $8.50.

Emmanuel Kayser's great *Lehrbuch der Geologie* was one of the cornerstones of a good geological education during the first quarter of this century. It grew into four dryly authentic volumes during the course of seven editions and was full of complicated Teutonic sentences and fossil names. Then Roland Brinkmann cut it in half, expunged unnecessary terminology, and infused it with well-founded, dynamic interpretations to create the new two-volume Kayser-Brinkmann *Abriss der Geologie*, which has now gone through eight editions of its own.

The second volume of the *Abriss* is, in fact, a streamlined account of the geologic evolution of Europe, with notes on other parts of the earth; it is this which Sanders has halved again to make the book here reviewed. He has transformed the original 360 pages of German into 161 pages of English by dropping three chapters entirely, by deleting sections of other chapters that deal with areas outside of Europe or with paleontology, and by condensing discussion and reducing fossil illustrations from 58 to 19 plates. The result is a highly abbreviated, synoptic account of the physical evolution of Europe from the Precambrian to the Recent era, in which Kayser's familiar illustrations of fossils and rocks are about all that remain to indicate its lineage.

American and British geologists should be grateful to Sanders and the publishers for making this book available. Now they can read in English about the historical geology of the European mainland from two up-to-date and complementary master sources: the complete translation of Alpinist Maurice Gignoux's *Géologie Stratigraphique* by Gwendolyn Woodford (Freeman) and this condensation of Variscanist Brinkmann's *Historische Geologie*.

In producing this book, Sanders has carried out well the difficult task of absorbing in one language and rewriting and editing in another which is the function of good scientific translating. There are few infelicities due to the translating and no important alterations of meaning. In the subject matter treated, the book is current with all but the most recent advances (such as those in Precambrian and Danian correlation). My only serious criticism is that the condensation is so drastic that it detracts from the coherence of the treatment and creates a didactic effect which was not conspicuous in the original book. Moreover, the new section, "History of European geology," is too abbreviated to be of much use to a beginner and is unnecessary for the geologist who is already well-enough informed to enjoy the rest of the book. Two curious historical errors should be corrected. H. B. de Saussure did not coin the word geology (page 2); it was used 83 years before his birth in M. P. Escholt's *Geologia Norwegica* (1657). The picturesque founder of the Carboniferous and Cretaceous systems was not J. B. but J. J. d'Omalius-d'Halloy (pages 44, 101, and 114).

We have here, nevertheless, a convenient and readable outline and source book, rich in lively reconstructions of the physical history of Europe. The correlation charts, taken with little change from the *Abriss*, form an excellent supplement to the National Research Council's correlation charts (as yet incomplete) for North America. The enormous structural complexity of Europe is well portrayed in words and sketches. The filling, stripping, and migration of interspersed basins and swells; the growth and eventual stabilization of successive overcrossing fold belts; the zones of flat thrust faulting and gravity sliding; the evolution of diapirically intruded, cratonal, sedimentary blankets—all are brought to life and interrelated. The outlook is that of a man (Brinkmann) who sees a natural syntax and episodic global similarities in rocks and historical events. Quite apart from the fact that this book offers a convenient way to learn about, or to refresh one's memory of, the major features of geological history in Western and Central Europe, it provides a needed counterbalance to the currently ascendant philosophy of gradualism. It is a good book to have around.

PRESTON E. CLOUD, JR.
U.S. Geological Survey, Washington, D.C.

Non-relativistic Quantum Mechanics. An introduction. R. M. Sillitto. Quadrangle Books, Chicago, Ill., 1960. vii + 230 pp. $7.50.

This text was written for the honors course in British schools, a course that does not have a direct counterpart in American colleges. It is a formal introduction to the methods of quantum mechanics but provides only a few illustrative examples and applications of the major techniques. In general, it is quite sketchy and does not contain enough material for use in beginning graduate courses, the level at which quantum mechanics is usually taught. The approach is axiomatic rather than historical; on the whole, the discussions are standard and brief. The topics are also standard, with few of them getting the detailed analysis necessary for their understanding.

GEORGE WEISS
University of Maryland

Characteristics of Teachers. David G. Ryans. American Council on Education, Washington, D.C., 1960. 416 pp. $7.50.

This is a volume for researchers. It is as technically careful a report of a study about teachers as can be found. As the prefatory note suggests, it "may well lead to improved selection, training and evaluative procedures for personnel in the teaching profession."

Teacher characteristics, a term used here to mean the classroom behavior of teachers and behavior conditioning factors, are regarded as the clue to the establishment of criteria by which the effectiveness of teachers can be measured.

The search for a reliable set of teacher competencies has often led teacher training institutions, teachers'

professional organizations, state departments of education, and other organizations and individuals to settle for criteria by compromise. This study may well mark the beginning of a new era in the development of criteria based on fact.

The director of the study, David G. Ryans, was professor of educational psychology and research at the University of California (Los Angeles) and is now chairman of the department of educational psychology at the University of Texas. He is recognized by colleagues in his field as one of its leading scholars.

This book is not only required reading for the student of educational research, but it also should give enlightenment and encouragement to high school guidance counselors, the staff in higher institutions preparing teachers, superintendents of schools—in fact, to all who have a concern in the education and employment of teachers and in the improvement of the teaching function.

WILLIAM P. VIALL
American Association for the Advancement of Science

Handbuch der Pflanzenanatomie. vol. 6, pt. 1, *Schizophyzeen*. Lothar Geitler. Gebrüder Borntraeger, Berlin, 1960. viii + 131 pp. Illus. DM. 46, subscription; DM. 57.50.

Faculty members on library committees as well as librarians wince at the announcement of each new monographic series in the biological sciences. Book funds are nearly depleted *ab initio* by standing orders. Nonetheless, thanks to the emphasis placed on research by government and industry, the number of libraries that can stand the financial strain is sufficiently large to guarantee publishers a profitable market. Small private institutions and individuals are casualties. So it is that each new series, and each component monograph, is received with mixed feelings. In some instances the duplication of material in existing series is so great that profit and prestige motives would seem to overshadow considerations of need and usefulness. The present monograph suffers only moderately from duplication, but the series of which it is a part has been a victim of overlapping by several newer series. The *Handbuch der Pflanzenanatomie*, founded by K. Linsbauer and continued by G. Tischler and A. Pascher, can claim several classical treatises, including Kylin's *Anatomie der Rhodophyceen* (1937). Although the first edition of the *Handbuch* was never completed, a second edition is being prepared under the direction of W. Zimmermann and P. Ozenda.

Geitler is a renowned plant cytologist and systematist of blue-green algae, so his treatment in the *Handbuch* may justly be considered authoritative. The large amount of significant literature that has appeared since the first edition (1936) has been skillfully incorporated into this revision, which otherwise closely follows the original version. A notable change is the omission of the section on endophytic Cyanophyceae, which Geitler has recently treated elsewhere (in *Handbuch der Pflanzenphysiologie*, vol. 11, 1959). Among earlier reviews of the cytology, morphology, and reproduction of blue-green algae may be mentioned Geitler's treatment of Cyanophyceae in Pascher's *Süsswasser-Flora* (1925), in Rabenhorst's *Kryptogamen-Flora* (1930–1932), and in Engler and Prantl's *Natürlichen Pflanzenfamilien* (1942). Whether the currency gained in the present work is worth the price must be decided by each book-buying committee; I am happy that the liberal policy of my institution permits an affirmative decision.

PAUL C. SILVA
Department of Botany, University of Illinois

New Books

Reprints

And There Was Light. The discovery of the universe. Rudolf Thiel. Translated from the German by Richard and Clara Winston. New American Library, New York, 1960. 398 pp. Illus. $0.75.

The Book of Scientific Discovery. How science has aided human welfare. D. M. Turner, Barnes and Noble, New York, ed. 3, 1960. 301 pp. Illus. $1.75.

A Compendium of Spherical Astronomy. With its applications to the determination and reduction of positions of the fixed stars. Simon Newcomb. Dover, New York, 1960.

Concepts of Space. The history of theories of space in physics. Max Jammer. Harper, New York, 1960. 222 pp. Illus. $1.40.

Darwin's Place in History. C. D. Darlington. Macmillan, New York, 1961. 100 pp. $2.

Dynamics. Horace Lamb. Cambridge Univ. Press, New York, 1960. 362 pp. $3.75.

Dynamics of Rigid Bodies. William Duncan MacMillan. Dover, New York, 1960. 491 pp. $2.

An Elementary Treatise on Curve Tracing. Percival Frost. Revised by R. J. T. Bell. Chelsea, New York, ed. 5, 1960. 224 pp.

The Exploration of Space. Arthur C. Clarke. Fawcett Publications, Greenwich, Conn., 1960. 192 pp. Illus. $0.50.

The Foundations of Arithmetic. A logico-mathematical enquiry into the concept of number. Gottlob Frege. Translated by J. L. Austin. Harper, New York, 1960. $1.25.

A History of the Theories of Aether and Electricity. vol. 1, *The Classical Theories*; vol. 2, *The Modern Theories, 1900–1926*. Sir Edmund Whittaker. Harper, New York, 1960. $1.95 each.

An Introductory Treatise on Dynamical Astronomy. H. C. Plummer. Dover, New York, 1960. 365 pp. $2.35.

An Introductory Treatise on the Lunar Theory. Ernest W. Brown. Dover, New York, 1960. 308 pp. $2.

A Manual of Spherical and Practical Astronomy. vol. 1, *Spherical Astronomy*, 708 pp.; vol. 2, *Theory and Use of Astronomical Instruments* (method of least squares), 631 pp. + plates. William Chauvenet. Dover, New York, 1960. $2.75 each; set, $5.50.

The Mechanism of Evolution. W. H. Dowdeswell. Harper, New York, 1960. 125 pp. $0.95.

Molluscs. J. E. Morton. Harper, New York, 1960. 232 pp. Illus. $1.40.

Natural Selection and Heredity. P. M. Sheppard. Harper, New York, 1960. 209 pp. $1.35.

Our Atmosphere. Theo Loebsack. Translated from the German by E. L. and D. Rewald. New American Library, New York, 1961. 190 pp. Illus. $0.50.

Petrology for Students. An introduction to the study of rocks under the microscope. Alfred Harker. Cambridge Univ. Press, New York, 1960. 289 pp. Illus. $1.95.

Physics for Everybody. Germaine and Arthur Beiser. Dutton, New York, 1960. 191 pp. Illus. $1.15.

Principles of Stellar Dynamics. S. Chandrasekhar. Dover, New York, 1960. 323 pp. Illus. $2. Republication of *Principles of Stellar Dynamics* (Univ. of Chicago Press, Chicago, 1942); "Dynamical Friction" pts. 1 and 2 [*Astrophyhs. J.* **97**, No. 2 (1943)]; and "New Methods in Stellar Dynamics" [*Ann. N.Y. Acad. Sci.* **45**, article 3 (1943)].

Rats, Lice and History. Being a study in biography, which, after twelve preliminary chapters indispensable for the preparation of the lay reader, deals with the life history of typhus fever. Hans Zinsser. Bantam Books, New York, 1960. 238 pp. Illus. $0.50.

Readable Relativity. Clement V. Durell. Harper, New York, 1960. 157 pp. Illus. $1.25.

Statistical Thermodynamics. A course of seminar lectures. Erwin Schrodinger. Cambridge Univ. Press, New York, 1960. 95 pp. $1.65.

The Universe Around Us. Sir James Jeans. Cambridge Univ. Press, New York, 1960. 307 pp. Illus. $1.95.

Reports

Effect of Electrostatic Field on Freezing of Supercooled Water and Insects

Abstract. Supercooled water and two species of insects froze at higher temperatures than normally when placed in an electrostatic field. The effect became more certain and occurred earlier as the amount of supercooling was increased. The amount of supercooling in the presence of the electrostatic field was not related to the amount in its absence.

Larvae of the wheat stem sawfly, *Cephus cinctus* Nort., when supercooled to −20°C, freeze at once on exposure to the discharge of a spark coil. Under certain conditions they freeze in the presence of the electrostatic field with no discharge. Water drops and larvae of the goldenrod gallfly, *Eurosta solidaginis* (Fitch), react similarly.

The two species of insects have widely different supercooling abilities: *C. cinctus* supercools about 25°C, *E. solidaginis* about 10°. Water was tested either as 20-mm³ hemispheroidal drops placed on 1-in. squares of aluminum foil, or as 50-mm³ drops injected into drops of fresh rubber cement, also on squares of foil. Experimental samples were placed at various constant temperatures on a horizontal metal plate in the vertical temperature gradient of a deep-freeze. The electrostatic field was generated by a Ford Model T spark coil energized by a 4 volt, 60 cy/sec source. One terminal led to the cold plate, the other to a 15-in. wire probe sheathed with glass tubing except for the terminal inch. The probe was held vertically ½ in. above each sample for 5 seconds, under which conditions no sparking occurred and a peak potential difference of about 15,000 volts was obtained.

Preliminary testing revealed that: (i) A spark or discharge is not necessary, though it produces a more certain effect, probably because the probe must be closer in order to discharge. (ii) The sample to be frozen must be on or close to one electrode. With the horizontal metal plate electrode, the samples could be separated from it by one or two thicknesses of paper, an oil film, or up to 0.5 mm of silicone grease. Separation by 2 mm or more of air suppressed the effect completely. Parallel-plate electrodes may be substituted for the point-and-plate pair to give a larger field area. (iii) The effect is directly proportional to the duration of the stimulus; hence probability is a determining factor, as it is in ordinary nucleation.

The effect of temperature on the percentages of larvae and water samples freezing in response to the electrostatic field is shown in Fig. 1. The response in all tests increased with increased supercooling. In addition, freezing was observed to occur earlier in the 5-second exposure period as the temperature was lowered.

Cephus cinctus exhibited a complete response to the stimulus at −10° to −12°C (Fig. 1*A*), with more than 10° of supercooling ability still remaining. Since *Eurosta solidaginis* supercools only to −10° to −12°C, most specimens were frozen at these temperatures before the electrostatic field was turned on, and they are not included in the calculations. That only about half of the remainder were nucleated by the field at these temperatures indicates a much less pronounced response by *E. solidaginis* (Fig. 1*B*) than by *C. cinctus*.

Water samples also showed a variable response to the electrostatic field, depending somewhat on their source but more on their configuration, size, and containing surfaces. The 20-mm³ drops froze in the presence of the field only at temperatures below −6°C (Fig. 1*C*), whereas all the drops encased in rubber cement froze at temperatures above −5°C (Fig. 1*D*). Both sets supercooled at least 10° when cooled in the absence of an electrostatic field.

Variability of response is thus shown both by insects and by water. Whereas *C. cinctus* larvae show a ready response to the stimulus of the electrostatic field, *E. solidaginis* larvae appear to have some resistance to its action, or perhaps they require a stronger field. The temperature ranges within which the two species responded to the stimulus were not determined by their usual supercooling abilities, though these of course impose a lower limit. Similarly, the water samples encased in rubber cement froze much more readily under the influence of the electrostatic field than did the bare droplets, even though both supercooled similar amounts in the absence of the field. The rubber cement therefore aided the action of the field in some unknown way, but did not affect ordinary supercooling.

The nature of the action of the field in stimulating nucleation can only be surmised at this time. The molecules of supercooled water, or the nucleating agents, or both, may be oriented by the field in a manner favorable to nucleus formation (*1*). Since the field oscillates, the molecules are not held stationary as in a crystal, but their polarity makes them subject to a certain amount of orientation, and the oscillation is a superimposed action. A d-c potential difference of equivalent magnitude may

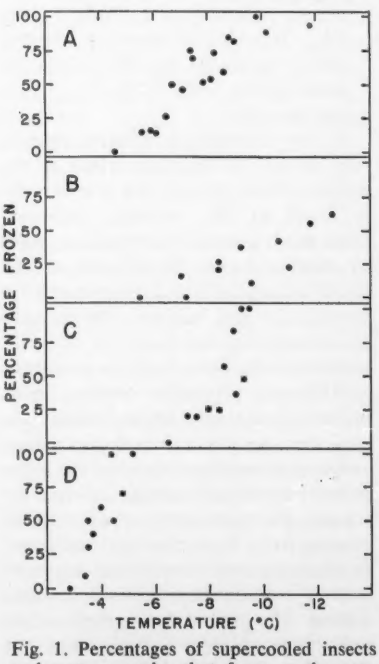

Fig. 1. Percentages of supercooled insects and water samples that froze at the constant temperatures indicated when exposed for 5 sec to an electrostatic field. *A*, Larvae of *Cephus cinctus*; *B*, larvae of *Eurosta solidaginis*; *C*, 20-mm³ water drops; *D*, water encased in rubber cement.

Instructions for preparing reports. Begin the report with an abstract of from 45 to 55 words. The abstract should *not* repeat phrases employed in the title. It should work with the title to give the reader a summary of the results presented in the report proper.

Type manuscripts double-spaced and submit one ribbon copy and one carbon copy.

Limit the report proper to the equivalent of 1200 words. This space includes that occupied by illustrative material as well as by the references and notes.

Limit illustrative material to *one* 2-column figure (that is, a figure whose width equals two columns of text) or to *one* 2-column table or to *two* 1-column illustrations, which may consist of two figures or two tables or one of each.

For further details see "Suggestions to Contributors" [*Science* **125**, 16 (1957)].

prove effective, but 1000 volts d-c gave negative results with *C. cinctus* larvae at −12°C when a ⅜-in. air gap and exposures up to 1 minute were used.

The necessity of having the sample close to an electrode or even forming an extension of it suggests that the conditions used in these experiments were near-minimal. The incomplete response by *E. solidaginis* larvae also supports such a view. However, if the field is strengthened by decreasing the gap, discharges will occur. Although nucleation was induced under these conditions, the side effects of the sparks, such as possible heating, were not investigated.

These results represent a preliminary excursion into a field that is new, biologically at least, and it is quite likely that some aspects that will later assume importance have been neglected or overlooked at this time. It has been demonstrated, however, that supercooled water and certain insects can be induced to freeze at higher temperatures than otherwise when placed in an electrostatic field. The effect becomes more certain and occurs earlier as the amount of supercooling is increased.

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1 August 1960

Lipids of Ankistrodesmus braunii

Abstract. *Ankistrodesmus braunii* was grown to stationary phase on a chemically defined medium and its cellular lipids were analyzed. The lipid content was found to vary from 18 to 73 percent of dry weight for cultures of different age and method of analysis. The pigments of the nonsaponifiable fraction were separated by adsorption chromatography and counter-current extraction and tentatively identified. The fatty acid fraction was converted to the corresponding methyl esters and analyzed by gas chromatography. The principal fatty acids present were: palmitic, oleic, and linolenic acids. Traces were detected of caprylic, capric, lauric, and palmitoleic acids.

Previous microscopic studies of *Ankistrodesmus braunii* during stationary phase indicated that the quantity of lipids synthesized by this green alga might be equal to or greater than that made by *Chlorella* spp. and related organisms (*1*). Potential use of algal metabolic products both as human nutritional supplements and in the closed ecosystems of space travel invited further investigation of the lipids of *A. braunii*.

Cultures of *A. braunii* strain 750 (Indiana University algal culture collection = McMillan clone 245-St 1.1) were grown in large erlenmeyer flasks to stationary phase in GFS medium previously described (*1*). The cells were maintained at 25° to 27°C with continuous daylight fluorescent illumination of 400 to 500 ft-ca for 4 to 8 weeks.

Cells were harvested by centrifugation and washed once with water. They were then suspended in 95 percent ethanol and placed in a boiling-water bath for 15 minutes to inactivate enzymes. The suspension was cooled, an equal volume of hexane was added, and the system was treated for 30 minutes in a 9 kcy/sec Raytheon sonic oscillator at maximum frequency. The suspension was transferred to a flask, most of the hexane was removed under vacuum, and the volume was made up with alcohol. A large aliquot was transferred to a boiling flask, potassium hydroxide was added, and the solution was saponified under reflux for 2 hours. The alkaline saponification mixture was extracted with hexane, then it was acidified and extracted with ether by the usual technique. All fractions were made up to volume and aliquots were removed for compositional analysis.

Pigments were separated on columns of powdered sugar and of anhydrous calcium carbonate by the procedure of Cowgill and Pardee (*2*). The hexane-soluble pigments were also subjected to countercurrent extraction on a 100-plate Craig apparatus in a solvent system consisting of 1.8 parts of petroleum ether and 1.0 part of 99 percent methanol.

Methyl esters of the algal fatty acids were prepared by the method of Clinton and Laskowski (*3*). Gas chromatographic separations were achieved on the Beckman GC-2 gas chromatograph with an 18-foot column of Resoflex R-446. Identification was based on standard samples.

Varying results were obtained in the determination of lipid content of *A. braunii* in stationary phase, depending on the age of the culture and method of analysis. Total lipids ranged from 18.6 to 33.7 percent for cultures from 4 to 7 weeks of age respectively. This is comparable to the findings of Collyer and Fogg (*4*) for a number of Chlorophyceae. Of the total lipids, 85.5 percent were recovered in the following distribution: nonsaponifiable, 17.1 percent; saponifiable, 61.5 percent; and glycerol, 6.8 percent. In one experiment where lipids were extracted from vacuum-dried cells, a lipid content of 72.8 percent was obtained, a value which would appear quite unreasonable were it not for similar observations of extremely high lipid content in cells subjected to vacuum drying while still living (*5*).

Adsorption chromatography and countercurrent distribution led to the separation of four principal pigments which were detectable by both techniques. Identification was based on known carotenoid spectra and is tentative: beta carotene, astaxanthin, lutein, and possibly a derivative of neoxanthin. The correct spectra and solubility were obtained for the first three. All of these pigments have previously been detected in algae (*6*).

The characteristic fatty acid composition of *A. braunii* in stationary phase is shown in Fig. 1. The principal fatty acids were found to be palmitic, oleic, and linolenic acids with traces of caprylic, capric, lauric, and palmitoleic acids. One sample showed a trace of linoleic acid. By the peak area method, the relative amounts of the three principal acids were linolenic acid, 13 percent; oleic acid, 54 percent; and palmitic acid, 33 percent. This algal fatty acid fraction is generally similar in composition to other vegetable oils, although

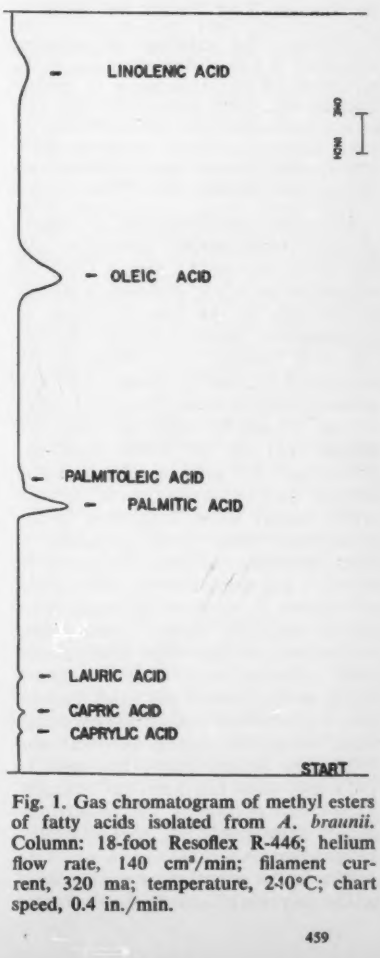

Fig. 1. Gas chromatogram of methyl esters of fatty acids isolated from *A. braunii*. Column: 18-foot Resoflex R-446; helium flow rate, 140 cm³/min; filament current, 320 ma; temperature, 240°C; chart speed, 0.4 in./min.

the predominance of linolenic acid over linoleic is somewhat unusual (*7*). Like the vegetable oils, algal oil would be digestible and nutritious for human beings.

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21 September 1960

Appearance of a Spring Maximum in Nuclear Test Debris in 1960

Abstract. The existence of a spring maximum in fallout deposition due to the disruption of the tropopause in middle latitudes has been debated for the past several years. Evidence obtained from air filters indicates elevated levels of radioactivity from nuclear tests in surface air during April through July 1960.

Increased concentrations of fission product radioactivity, primarily Sr^{90} and Cs^{137}, observed in spring rains led Stewart *et al.* (*1*) to postulate a seasonal variation in the rate of release of stratospheric debris. Earlier Brewer (*2*) and Dobson (*3*) attributed the springtime increase in levels of stratosphere-produced ozone found in surface air to a similar seasonal variation. Martell (*4*) on the other hand has pointed out that such maxima in fission activity have coincided with, or followed shortly after, major test series, particularly those tests conducted in more northern latitudes. Inherent in Martell's supposition is the assumption that debris from more northerly sites has a materially shorter stratospheric residence time than does that coming from equatorial tests. This assumption seems to be justified (*5*), and, indeed, tests were carried out at northern latitudes during the springs of 1957 and 1958. The spring maximum seen in 1959 may also fall into this category since a fair portion of the activity observed originated in the Soviet October 1958 series (*6*).

Due to the cessation of nuclear tests in October 1958, and to the degree of mixing in the upper atmosphere which took place by early 1960, any maximum observed should be the result of meteorological mechanisms rather than recent testing. Some caution is still in order, however, since two nuclear detonations (albeit relatively small) were carried out by France in North Africa in February and April 1960. Therefore a rise in gross fission activity may be subject to misinterpretation, although analysis for specific radionuclides would avoid this difficulty.

Surface air-borne activity was collected from approximately 5×10^5 cubic meters of air per month by means of HV-70 (Hollingsworth-Vose) filters placed in air pumps located on the Argonne site and adjacent area (*7*). Measurements of radioactivity were made on ashed filters by means of sodium iodide scintillation spectrometry (*8*). The monthly sums of activity (gross gamma) due to Ce^{144}, Ru^{106}, Cs^{137}, and Zr^{95}-Nb^{95} in curies per cubic meter are shown in Fig. 1 for the time interval of January 1958 through July 1960. Maxima in the springs of 1958 and 1959, as well as a secondary maximum in the fall of 1958, are clearly evident. Those in 1958 coincide fairly well with the immediately preceding test series as indicated. Similar behavior is evidenced by Cs^{137} from January 1957 through July 1960.

In the spring of 1960 the gross gamma activity shows a rise during April through June, with a somewhat broader peak for Cs^{137} than for the mixture. A portion of the gross gamma activity in February and March was due to Ce^{141} and Ru^{103}, thus causing the relative increase in April to be somewhat less pronounced than in the case of Cs^{137}. Short-lived fission products were also present in precipitation at Argonne during this time, and were observed in the air as far north as Great Britain (*9*). A fivefold increase in Cs^{137} was seen in the spring during 1957 through 1959, whereas only a twofold increase was observed in 1960. This may reflect the presence of higher relative concentrations of debris in the polar stratosphere during past years than prevailed during the spring of 1960. In any event there appears to be a definite spring maximum in fission product radioactivity in 1960 which is not attributable to recent testing.

It should be mentioned that a portion of the total Cs^{137} activity present in the spring of 1960 (as much as 10 percent) was associated with debris from high-altitude missile detonations (August 1958) as indicated by increased con-

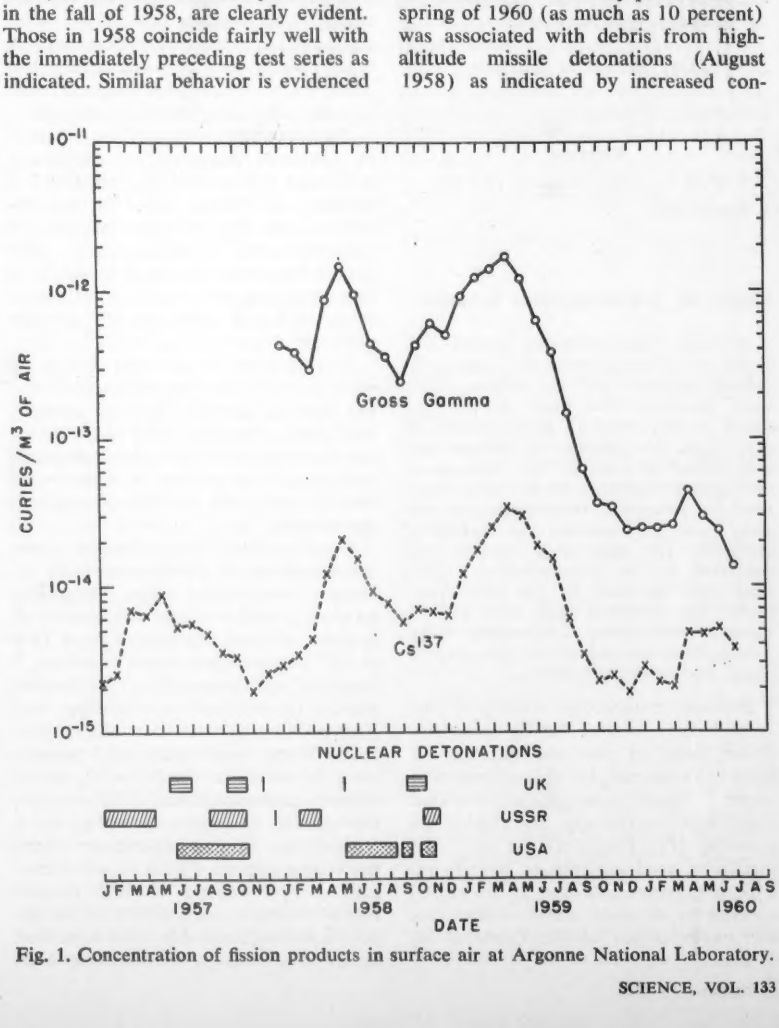

Fig. 1. Concentration of fission products in surface air at Argonne National Laboratory.

centrations of the Rh^{102} tracer in surface air. One might therefore be tempted to attribute the increase to this source alone were it not for the debris from Hardtack I, labeled with $W^{181,185}$ and still present in measurable amount, which clearly shows a twofold rise in April through June 1960.

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23 November 1960

Latitudinal Effect in the Transfer of Radiocarbon from Stratosphere to Troposphere

Abstract. Latitudinal variations in the descent of bomb-produced radiocarbon from the stratosphere is suggested by differences in tropospheric carbon-14 activity. The magnitude of a similar latitudinal effect in the pre-bomb steady state is estimated. This effect may be part of the explanation of the short-term oscillations in carbon-14 activity found in tree-rings from the last 1300 years.

Several investigators have reported on the bomb-produced rise in the C^{14}/C^{12} ratio of tropospheric CO_2 from the Northern Hemisphere (*1–5*). From 1955 and up to the summer of 1957 an annual linear increase of approximately 5 percent was indicated at all stations. From 1957 the rate of increase showed marked differences at various localities in the Northern Hemisphere. The highest tropospheric C^{14}/C^{12} ratios so far reported were derived from a series of Danish cereals (*4*) which were collected from 1956–59 (latitude 56°N, longitude 12°E).

Comprehensive measurements of the increase in tropospheric C^{14}/C^{12} ratios have been made by Broecker and Walton (*2*) and Broecker and Olson (*5*). The annual rate of increase was here derived from plant material and from atmospheric CO_2 collected at stations scattered over the United States and over the North Atlantic Ocean at latitudes from 25° to 41°N, and at longitudes from 30° to 120°W. Their values may be considered as close to the average values for the Northern Hemisphere.

The increases in C^{14} activity attained in the two series by 1 July in the years 1956–59 are listed in Table 1. The activities are expressed in ΔC^{14} units (*6*), that is, approximately the permillage difference from the age-corrected activity of 19th-century wood.

In 1958 the C^{14}/C^{12} ratio at Copenhagen was 37 per mil higher than the supposed hemispheric average measured in the United States and over the North Atlantic, while in 1959 this difference had risen to 63 per mil. As late as 12 October 1959 the C^{14}/C^{12} ratio in atmospheric CO_2 collected at Alpine, New Jersey (U.S.A.), was not higher than $\Delta C^{14} = 246 \pm 6$ per mil (*5*).

The higher C^{14}/C^{12} ratio in northern latitudes in Europe in 1959 was confirmed by measurements of cereals from Cambridge (latitude 52°N, longitude 0°). The C^{14}/C^{12} ratio in the summer of 1959 was measured here to 31.8 ± 0.7 percent above the 1953 ratio (*3*). Assuming a similar Suess effect and isotopic fractionation as for the Danish cereals, this corresponds to a ΔC^{14} value of approximately 298 per mil.

The differences indicate that the dominant descent of bomb-generated C^{14} from the stratosphere took place in locations situated closer to Copenhagen and Cambridge than to the United States and the North Atlantic south of 41°N. Although it cannot be excluded that part of the differences are due to different distances from the test sites located in high northern latitudes, the most probable explanation is latitudinal variations in the descent of CO_2 from the stratosphere (*4*). These variations are presumably caused by a selective downward mixing from the stratosphere in middle latitudes by way of the gap in the tropopause (*7, 8*).

The comparatively large additional increase in C^{14} activity at Copenhagen above the hemispheric average, together with the low activity found in atmospheric CO_2 over the United States as late as October 1959, suggests that the higher C^{14} concentration can only prevail in a narrow belt or during short time periods. This is in keeping with suggestions of strong seasonal variations for both particulate fallout (*7*) and for C^{14} (*9*).

Latitudinal variations may likewise have occurred in the pre-bomb steady state. The magnitude of such an effect can be estimated from the net transfers of C^{14} atoms from the stratosphere to the troposphere, if it is supposed that the relative distribution of C^{14} atoms in the lower stratosphere was similar in the pre-bomb state and in 1958 and 1959.

Table 1. Carbon-14 content of Danish cereals (*4*) and average C^{14} content in samples from the United States and in atmospheric CO_2 over the North Atlantic by 1 July of each year (*5*), in ΔC^{14} units (per mil).

Year	Copenhagen (56°N)	U.S. and North Atlantic (25°–41°N)	Difference
1956	39 ± 8	30	9
1957	89 ± 7	80	9
1958	172 ± 7	135	37
1959	308 ± 6	245	63

In the pre-bomb state an excess of approximately 10^{28} atoms of C^{14} was annually transferred from the stratosphere to the troposphere of each hemisphere. From July 1957 to July 1958 the net transfer to the troposphere of the Northern Hemisphere was 10^{28} atoms plus the number of transferred artificial C^{14} atoms. This last figure may be evaluated to 7×10^{28} atoms on the basis of the measured rise of 5 percent in tropospheric C^{14} activity. The total net transfer during this period thus becomes 8×10^{28} atoms of C^{14}. From July 1958 to July 1959 the total net transfer of C^{14} atoms to the troposphere of the Northern Hemisphere is evaluated from the 11 percent (*5*) rise in C^{14} activity to a total of 16×10^{28} atoms.

Assuming that the magnitude of the latitudinal effect is proportional to the net transfer of C^{14} atoms from stratosphere to troposphere, and using the 1958 values of 37 per mil difference and a net transfer of 8×10^{28} atoms, the pre-bomb steady state latitudinal effect is calculated to 5 per mil. Using the 1959 values of a difference of 63 per mil and a net transfer of 16×10^{28} atoms of C^{14}, the pre-bomb latitudinal effect is calculated to 4 per mil.

Since a fraction of the bomb-produced C^{14} is added directly to the troposphere and, therefore, may not contribute to a latitudinal effect in plant material—or may even tend to counterbalance it—the above estimates are rather lower limits. It is not known, moreover, whether the C^{14} concentrations measured in Copenhagen represent the peak values for the hemisphere. In view of this, the most likely range for the magnitude of a latitudinal effect in the steady state distribution of the natural radiocarbon in 5 to 10 per mil.

The same magnitude is suggested with another way of estimating: 10^{28} atoms of C^{14} are annually produced by cosmic rays in the stratosphere of the Northern Hemisphere. Approximately 75 percent of these atoms are produced in the lower stratosphere north of 45°N.

If, within a few months during the spring, two-thirds of the 75 percent (0.5×10^{28} atoms) are mixed into a belt of the troposphere (for example, 45° to 60°N) containing 3×10^{27} atoms, and if the time constant for growth of concentration is roughly equal to the time constant for leakage out of the belt, an average rise in C^{14} concentration of 5 per mil is temporarily produced in the belt, and the peak concentration may attain a somewhat higher value.

Slightly elevated C^{14} concentrations, attributable to a latitudinal effect, may thus have prevailed in a belt around middle latitudes, at least during a period of the year. If the geographic position of this belt is closely related to the position of the tropopause gap or gaps, the belt has had a rather irregular course around the hemisphere.

With changing climates the position of the belt of elevated C^{14} concentration may have shifted in the past after shifts in the position of the tropopause gap. At fixed locations in middle latitudes such shifts will produce oscillations in the C^{14} activity of plant material. This may be part of the explanation of the rather sudden variations in C^{14} activity traced in tree-rings from the last 1300 years (*10*, *11*). The C^{14} activity of tree-rings has been found to vary both with time and with location on the earth. The variations with time appear to be composed of short-term oscillations of 1 to 2 percent superimposed upon an oscillation having a longer period (*11*). The variations with location are up to 1 percent (*10*). The oscillations seem to be correlated with climatic phenomena.

Latitudinal variations as estimated above may have contributed substantially to the short-term oscillations in the C^{14} activity of the tree-rings, and in addition may account for the minor differences found in the C^{14} activity of plant material from different locations. Changes in cosmic ray flux, or climatically induced changes in the exchange rate of CO_2 between the ocean and the atmosphere, may likewise contribute to the oscillations occurring with time as previously proposed (*10*), but cannot account for geographical variations.

The present explanation of these oscillations may be tested by assaying series of tree-rings collected at different latitudes. The interpretation of such measurements, however, may be complicated because of the irregular, meandering course of the tropopause gap.

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20 June 1960

Growth Inhibition of Insects and a Fungus by Indole-3-Acetonitrile

Abstract. Indole-3-acetonitrile obtained from cabbage has been found to inhibit growth of *Pyrausta nubilalis* (Hbn.), *Galleria mellonella* (L.), and *Penicillium chrysogenum.*

A broad study of the resistance of the plant host to insects and fungi is being carried forth in these laboratories (*1*), and among the plants being studied is the cabbage. Several different strains of cabbage were used in the preliminary investigation.

The outer leaves of full-grown cabbage plants were removed and dried at a temperature of 60°C for 48 hours. During the drying process a loss of 90 percent in weight was observed. The dried leaves were placed in a Waring blender and reduced to a powder which was then placed in a Soxhlet extractor. Water extraction was continued for 48 hours, and the extract was filtered and concentrated in a vacuum to give a solution representing 1 g of dry plant material per milliliter of solution. The aqueous solution was extracted with ether in a continuous extractor for 24 hours. The ether extract was washed with 5 percent potassium hydroxide and with distilled water, and then it was dried with anhydrous sodium sulfate. The ether was removed in a vacuum and the residue was chromatographed on a chloroform-silicic acid column. Elution of the column with chloroform gave an oil which on purification gave an infrared spectrum having strong absorption at 4.42 μ (C≅N). Hydrolysis of the oil produced indole-3-acetic acid. The oil showed superimposable ultraviolet and infrared spectra with an authentic sample of indole-3-acetonitrile.

Table 1. Effect of indole-3-acetonitrile on growth of a fungus and two insect species.

Indole-3-acetonitrile (mg/g medium)	Growth inhibition (%)
Penicillium chrysogenum	
0.20	100.0
0.10	66.7
0.08*	50.0*
0.05	13.6
0.02	4.0
0.01	0.0
Pyrausta nubilalis (Hbn.)	
1.40	85.3
0.70	66.4
0.45*	50.0*
0.35	44.8
0.17	31.2
Galleria mellonella (L.)	
2.00	95.0
1.00	84.2
0.50	63.3
0.25	50.8
0.12	38.4
0.06	23.1

*Calculated from dosage-response curves.

The nitrile was found to inhibit the growth of *Pyrausta nubilalis* (Hbn.), *Galleria mellonella* (L.), and *Penicillium chrysogenum.* Previously described assay methods were employed (*2*). The inhibition at various concentrations is shown in Table 1. Indole-3-acetic acid did not inhibit growth under our assay conditions.

Previously, in a study of neutral auxins in plants, Jones and his coworkers (*3*) isolated indole-3-acetonitrile from cabbage and found it to have remarkably high activity in the oat auxin bioassay.

At present, an investigation is under way to determine if field resistance variation in cabbage plants to insects is directly proportional to the concentration of indole-3-acetonitrile. Preliminary studies have shown an average concentration of 0.016 percent indole-3-acetonitrile in cabbage on a wet-weight basis. This concentration in the plant correlates well with the amounts used to obtain growth inhibition in the laboratory. Evidence for other growth-inhibiting factors in cabbage has also been obtained.

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27 December 1960

Paul M. Gross, President-Elect

At a time when the scientific revolution and its consequences for society are insufficiently comprehended by scientists and nonscientists alike, it is vitally important that our nation utilize to the full those rare scientists whose research has contributed significantly to the progress of their own disciplines and who also have acquired deep appreciation of the corpus of science, of the scientific method, and of the personality and motivations of scientists; who have developed a comprehensive grasp of modern technology; and who have demonstrated administrative skill of a high order, while maintaining an abiding faith in the university as the symbol and instrument of man's noblest aspirations. Such are the desiderata to be sought in the president of the Association. And such, indeed, are the qualifications of Paul Magnus Gross, president-elect. A lifetime of successful endeavor as teacher, investigator, and administrator extraordinary have prepared him for the diverse challenges of this position of leadership in American science.

When the bequest of James B. Duke made possible the conversion of Trinity College to Duke University, Paul Gross was already a respected physical chemist, the William Howell Pegram professor of chemistry and chairman of the department. In the years since, he has been one of the principal architects of the complex transformation of a good small college into an important national university. Devoted to the maintenance of standards of excellence, he repeatedly emphasized that the quality of a university is to be equated with the quality of its faculty; that the suddenly increased resources of the university should be used first to strengthen those enterprises already in being, and that creation of new departments or schools should be undertaken only when the faculty of existing departments represented a community of productive scholars worthy of a true university. As dean of the Graduate School from 1947 to 1952 and as vice-president in the Division of Education from 1949 to 1960, he was in a position to implement this philosophy. His was the guiding genius which brought accomplished scholars to all segments of the university—in the humanities and social sciences as well as in the natural sciences and professional schools. By 1958 he should have found satisfaction in the general recognition that the initial phase of the transition had been accomplished; the good small college was now a good university. But he also recognized that the resources available to the university had not been exploited to the full and that the time had come for initiating the second phase, the development of a truly great university to serve the people of North Carolina, the South, and the nation. Accordingly, he initiated an intensive, long-range planning effort which is even now under way, energetically developing a blueprint for the future of Duke University. But his academic efforts have not been restricted to Duke University. For example, in 1952 he organized the Council of Southern Universities; he served as its first president and has served as treasurer ever since. The academic world is truly indebted to Paul Gross.

Paul M. Gross

As a physical chemist, Paul Gross was trained at the College of the City of New York (B.S., 1916) and at Columbia University (Ph.D., 1919), with a brief interlude of service as second lieutenant in the Chemical Warfare Service during World War I. Soon after his arrival at Trinity College in 1919 he initiated a long-term study of the fluorination of organic molecules, a study which was continued and extended by L. A. Bigelow. The chemistry department at Duke has been a renowned center for the study of organic fluorine compounds ever since. As his department grew, Gross exercised the greatest care in selecting his enlarged faculty, most notably the distinguished theoretical chemist Frederick London.

Perhaps the most important single influence on his career was a year spent in Leipzig (1929) with Peter Debye, an experience which produced an enduring friendship as well as a series of incisive analyses of molecular structure based upon estimation of dipole moments and magnetic susceptibility. To cite only a few results, these analyses permitted characterization of aromatic structures, estimation of the extent of covalent character of the bonds of the halogen acids, decisions concerning the structure of various aromatic isomers, and estimates of the extent of group rotation in substituted aromatic molecules. In parallel, he and his students engaged in systematic studies of solution chemistry, with emphasis on solutions of nonelectrolytes in aqueous media; the sum of these studies has been a comprehensive and revealing test of the Debye-Hückel theory of solutions. In recognition of his competence as a physical chemist, in 1946 he was elected chairman of the Division of Physical Chemistry of the American Chemical Society.

Although the son of Magnus and Ellen Sullivan Gross, born in 1895, is a native of New York City, few have contributed so much to the renaissance of his adopted southland. Recognizing the importance of tobacco in the economy of North Carolina, in 1927 he instituted a continuing series of investigations on the cultivation and curing of tobacco, many of these in collaboration with Frederick Wolff, professor of mycology. Their studies of the chemical changes that occur in the ripening and curing of tobacco altered

the purchasing practices of all the major tobacco companies. The demonstration that selected strains of aromatic tobaccos thrive when grown under conditions of semistarvation (that is, closely spaced in the field and with a relatively light application of fertilizer) has led to a continuing research and development enterprise, still in progress, which holds out the hope that American manufacturers may in the future be freed of the necessity of importing aromatic tobacco for blending with domestic varieties. Similarly, American manufacturers had been dependent upon French cigarette paper, which was in acutely short supply during World War I. Gross and his colleagues experimented with various possibilities and demonstrated that such paper could successfully be prepared from flax and hemp. It is worth noting that the first truckload of American-made cigarette paper, prepared from California flax, rolled out of a North Carolina factory on the same day that Hitler's trucks rolled into Poland. For these and many other contributions Gross received the Herty medal, presented annually by Georgia State College to the "outstanding chemist in the South"; the first honorary award of the Florida section of the American Chemical Society, for "outstanding contributions and service to humanity through the science of chemistry"; and the science award of the Southern Association of Science and Industry, for "outstanding work in Southern regional development."

In further service to his adopted state, from 1955 to 1958 Gross served on the Governor's Committee to formulate and implement plans for the development of an industrial research park, the Research Triangle, in the area bounded by Duke University, the University of North Carolina, and North Carolina State College. Since 1958 he has been a member of the board of directors of the Research Triangle Institute, cornerstone of this already successful venture, which has brought the research laboratories of a group of major industrial corporations into the area.

As the magnitude of the national scientific effort expanded after World War II, with increasing frequency the nation availed itself of his counsel. As member and vice-chairman of the board of the National Science Foundation (1950–), president of the Oak Ridge Institute for Nuclear Studies (1949–), scientific adviser to the American delegation to the General UNESCO Conference of 1949 and, since then, member of the Committee on Science in UNESCO of the National Research Council, and member of the National Advisory Cancer Council of the U.S. Public Health Service (1959–), to cite only some major instances, he has served science and his country with distinction, providing not only broad scientific knowledge and administrative skill but that even more precious attribute, wisdom. These facts were duly noted when his alma mater awarded him the Townsend Harris medal in 1953 and the Carnegie Corporation presented him with its "Manship Award" in 1954.

Perhaps because he has ever remained conscious that one of the most serious problems facing the South derives from the fact that many of its brightest young people leave the South for advanced academic and professional training, never to return, he has devoted much effort to developing means of identifying and training talented young people. Accordingly, he has frequently been called upon to serve in this connection also. Thus, the President's Committee on Scientists and Engineers, in 1958, requested him to serve as chairman of the Panel on Advanced Training for Superior Talent–Graduate Education and Research. From 1953 to 1956 he was chairman of the Southern Regional Scholarship Committee for selection of Marshall scholars to study in Great Britain, a service which was recognized by his appointment as Honorary Commander of the Civil Division of the Order of the British Empire by Her Majesty, Queen Elizabeth II, in 1958. Last year he was asked to serve as a trustee of the Woodrow Wilson National Fellowship Foundation, and the previous year he served as adviser to the Stern Foundation on its project "The Recognition of Excellence."

No episode in the life of this devoted servant of society has been more remarkable than his role in World War II. Early in the war he became aware of the Army Air Force's need for improved means of gunnery training, particularly the great need for actual firing at normal targets in the air, to meet the psychological requirements of preparation for combat. The problem was simple: to fire through a standard weapon a projectile with all the standard characteristics but one—it must do no damage while readily indicating successful hits. These requirements seemed so impossible of fulfillment that it was impossible for Gross and his colleagues to obtain an NDRC contract for the development of a "frangible bullet." But the need was so great, the problem so pressing, that Gross, with assistance from the Bakelite Corporation and from a group at Princeton University, utilized the resources of his own university to get on with the problem. Only after the major problems had been solved was an appropriate contract let and the project reinforced with staff and equipment. In less than a year a successful frangible bullet with good ballistics had been designed and manufactured, target planes had been lightly armored but retained their flight characteristics, a hit indicator system had been designed and built, and standard .30-caliber machine guns had been modified to utilize the frangible bullet. Use of these training devices was then instituted as rapidly as possible in the Army Air Force gunnery schools.

This extraordinary service was recognized in the award to Gross of the Medal of Merit, the highest civilian award of the United States Government. To quote the citation by the President of the United States: "The Medal for Merit has been awarded to Dr. Paul Magnus Gross for exceptional meritorious conduct in the performance of outstanding service to the United States from July 1942 to September 1945. . . . Although a chemist, he successfully solved serious problems in the fields of ballistics, machine gun modification, characteristics of armour, electrical circuits, plastics and remote control mechanisms. Against great odds, he worked indefatigably for over two and one-half years. The frangible bullet which he developed, with its accessories, provided means of actual machine gun fire from a bomber in flight, against actual fighter planes simulating hostile attack. The success of his efforts was due to his abilities and his penetrating understanding of the need. Dr. Gross persisted until what he believed possible came true and thereby made an invaluable contribution to the war effort of the United States."

Essential to the success of these diverse responsibilities and challenges has been the tranquil home fashioned by his wife, Gladys Petersen Gross. Moreover, her gracious hospitality contributed in no small measure to the success of the continuing task of building the university. Love of the university has been a way of life in their home; their son, Paul, Jr., is now on the faculty of Wake Forest College, while the hus-

band of their daughter, Beatrix Cobb Ramey, is on the faculty of the University of Virginia.

On the coast of North Carolina, not far from the Duke University Marine Biology Laboratory, Paul and "Peter" maintain a modest beach house which serves to unite the family in the summers and serves also as drydock for a collection of sailing craft, most precious of which is the one built by Paul and Paul, Jr. Near at hand is the only luxury Gross ever allowed himself—an ocean-going powered vessel equipped for deep-sea fishing. His friends, colleagues, and students know that Paul Gross will give of himself and his wisdom to the Association as he has in the past and that, accordingly, the affairs of the Association must surely prosper. But we hope, too, that he will occasionally find a moment to listen to the gentle slap of waves against the hull.

PHILIP HANDLER
Department of Biochemistry,
Duke University Medical Center,
Durham, North Carolina

AAAS Council Meeting, 1960

Dael Wolfle

The Council of the AAAS met twice during the annual meeting of the Association in New York, 26 to 31 December. Both sessions were under the chairmanship of President Chauncey D. Leake and both were held at the Commodore Hotel. One hundred and fifty-two Council members attended the first session, at 4:00 P.M. on 27 December, and 131 the second session, at 9:00 A.M. on 30 December. The Chairman of the Board of Directors, Paul E. Klopsteg, and the President, Chauncey D. Leake, reviewed Association activities and problems.

Elections and Officers

The President announced that Council, by mail ballot, had elected Paul M. Gross as president-elect; had reelected Don K. Price and Alan T. Waterman as members of the Board of Directors for four-year terms; and had elected Henry Eyring to complete the one remaining year of an uncompleted term on the Board of Directors.

The vice presidents and chairmen of sections, as elected by the Council, are listed on pages 468 to 471. Council voted authority to the Board of Directors to elect vice presidents and chairmen for those sections that had not yet presented nominations for these positions.

The Executive Officer reported that the Board of Directors had reappointed Allen T. Bonnell of the Drexel Institute of Technology as Secretary of the Section on Industrial Science and had appointed the following new section secretaries: Section on Mathematics, Wallace Givens of Northwestern University; Section on Chemistry, S. L. Meisel of Socony Mobil Oil Company; Section on Geology and Geography, Richard H. Mahard of Denison University; Section on Engineering, Leroy K. Wheelock of the Engineers Joint Council; and Section on Medical Sciences, Oscar Touster of Vanderbilt University School of Medicine. All are to serve for four-year terms, 1961 through 1964.

Council Activities and Organization

Much of the time of the 1959 meeting was devoted to consideration of a report of the Committee on Council Activities and Organization. Most of the recommendations of that committee were approved by Council, as reported in the minutes of the 1959 meeting [*Science* **131**, 503 (19 Feb. 1960)], but some matters were left unsettled, and to help in their settlement the Committee on Council Activities and Organization was continued for an additional year. The committee reported that it had worked closely wtih the Board of Directors in arriving at recommendations for certain changes in the constitution and bylaws. The proposed amendments were published in *Science* [**132**, 1558 (25 Nov. 1960)].

William A. Wildhack, chairman of the Committee on Council Activities and Organization, introduced the committee report and recommended approval by Council of its recommendations. Council voted to approve the following amendments to the constitution.

Article IV, Section 1

Substitute the following statement for the present Article IV, Section 1:

Responsibility for the affairs of the Association is vested in the Council, which shall have authority to delegate functions to the Board of Directors.

In addition to other powers and responsibilities set forth herein, Council shall:

(*a*) determine the rights and privileges of members, and prescribe the dues and fees to be paid by members;

(*b*) elect general officers of the Association;

(*c*) provide for the organization of the Association in sections in accordance with the fields of interest of its members;

(*d*) authorize the establishment of regional divisions of the Association;

(*e*) determine the conditions of affiliation and elect affiliates of the Association;

(*f*) establish special study committees to report to the Council on any aspect of Association policy or program or on other matters affecting the advancement of science; and

(*g*) establish committees to aid the Council in the discharge of any of the above responsibilities.

Article V, Section 1

Substitute the following statement for the present Article V, Section 1:

The Board of Directors shall have, hold, and administer all the property, funds, and activities of the Association. It shall:

(*a*) take such actions as it deems necessary to carry out the purposes of the Association;

(*b*) make recommendations to the Council;

(*c*) appoint the administrative officers of the Association;

(*d*) in the event of a vacancy in the office of a general officer other than the office of president-elect, elect a replacement for the remainder of the unexpired term. In the event of a vacancy in the office of president-elect, replacement shall be by election by the Council;

(*e*) appoint and supervise the work of all committees except those described in Article IV, Section 1, paragraphs (*f*) and (*g*);

(*f*) determine the time and place of meetings of or meetings sponsored by the Association;

(*g*) elect Fellows from among the members of the Association;

(*h*) prepare and publish an annual budget for the Association and arrange for an annual independent audit of the accounts of the Association; and

(*i*) perform such other functions as the Council may assign to it from time to time.

AAAS budget for 1961.

Receipts	
Members' dues	$ 495,000
Nonmember subscriptions	95,000
Back issues, etc.	4,000
Advertising in *Science*	700,000
Sale of:	
Microcards	700
Binders	1,800
Symposia	60,000
Emblems	1,800
Annual meeting	30,000
Rental receipts	16,000
Income from investments	25,000
Cash discounts	500
Administration of projects	36,000
Other	4,500
Total receipts	$1,470,300
Expenses	
Expenses not categorized by function:	
Salaries	$ 247,000
Insurance, retirement, social security	24,000
Supplies	21,800
Telephone	3,400
Postage	15,800
Travel	3,000
Miscellaneous	14,650
Printing and manufacturing *Science*	610,000
Editorial Board	7,300
Advertising	175,000
Symposium volumes	40,000
AAAS Bulletin	12,000
Daedalus	4,000
Annual meeting and exposition	26,000
Press service	9,500
Academy conferences	1,500
Public understanding	29,000
Building maintenance	53,700
Interest	4,400
Depreciation, building and equipment	35,500
Microcards	600
Binders	1,500
Emblems	1,200
Board of Directors	6,500
AAAS committees	10,000
Section expense	6,000
Division expense	10,700
Exec. Officer's discretionary fund	5,000
Contingencies	10,000
Total expenses	$1,389,050
Net receipts	$ 81,250

Compensatory Changes

(*a*) Delete the final sentence of Article III, Section 2.

(*b*) Delete from Article V, Section 2, the sentence beginning, "In the event of a vacancy in the office of an elected member of the Board of Directors. . . ."

(*c*) Revise Article V, Section 4, by adding the underlined words: "The Board of Directors shall appoint such committees, *other than those described in Article IV, Section 1, paragraphs (f) and (g)*, as may be necessary to aid in the management of the Association. The duties of standing committees shall be stated in the bylaws."

Related to the above amendments to the constitution and also jointly recommended by the Board of Directors and the Committee on Council Activities and Organization were several amendments to the by-laws. Council voted its approval of these amendments, and the Board of Directors, in session on 29 December, formally adopted the following amendments to the bylaws.

Addition of New Section to Article V of Bylaws

Section 11. The Committee on Council Affairs shall consist of: nine members elected by the Council for terms of three years each, the terms of three of whom shall expire on January 14 of each year; the president-elect of the Association, who shall serve as chairman of the committee; and the secretary of the Council, who shall serve as secretary of the committee without vote. The committee shall (*a*) prepare the agenda for meetings of the Council, (*b*) receive or initiate, coordinate, and advise on reports of Council committees, resolutions, or actions submitted for consideration by the Council, (*c*) establish or recommend to the Council the establishment of appropriate study committees to report to the Council on any aspect of Association policy or program or on other matters affecting the advancement of science, (*d*) recommend to the Council appropriate changes in the constitution and bylaws.

Amendment to Article V, Section 1, of Bylaws

The underlined words were added to the section: "The committees shall be standing, as provided in the bylaws, or special, as the Board of Directors *or Council* approve. All standing committees, *except the Committee on Council Affairs*, shall report annually in writing to the Board of Directors. The chairmen of committees, *unless otherwise provided for in these bylaws*, shall be designated by the Board of Directors."

Article XIII

As a replacement for the article specifying that amendments to the bylaws shall be made by the Board of Directors, the following wording was adopted: "The bylaws may be amended by majority vote of the Council at any meeting or by mail ballot."

On recommendation of the Committee on Council Activities and Organization, Council voted to rescind the action it took at the 1959 annual meeting in establishing a standing Committee on Constitution and Rules. The function of this committee was, by action taken above, assigned to the new Committee on Council Affairs.

Committee on Council Affairs

A major purpose of the above amendments was to establish a standing Committee on Council Affairs. From a slate of names submitted by the Committee on Nominations and Elections, Council elected the following persons to serve on the Committee on Council Affairs: for three-year terms, Allan D. Bass of Vanderbilt University, Warren Weaver of the Alfred P. Sloan Foundation, and William A. Wildhack of the National Bureau of Standards; for two-year terms, Barry Commoner of Washington University, Alfred E. Emerson of the University of Chicago, and Charles B. Hitchcock of the American Geographical Society; for one-year terms, Stanley A. Cain of the University of Michigan, Kenneth C. Spengler of the American Meteorological Society, and Frank Bradshaw Wood of the University of Pennsylvania. The president-elect of the Association serves ex officio as chairman of the Committee on Council Affairs, and the executive officer of the Association serves ex officio as secretary of the committee.

The President and the Chairman of the Committee on Council Activities and Organization (which automatically went out of existence when the Committee on Council Affairs was approved as a standing committee of the Association) announced that five study committees of the Council had been appointed. These are committees on Research in Small Colleges, International Scientific Communication, Science in Secondary School Education, Administration of Scientific Work, and Graduate Science Education and Standards. Study committees will hereafter report to and be coordinated by the Committee on Council Affairs.

Council voted to delegate to the Committee on Council Affairs authority to select two new members of the Commit-

tee on Nominations and Elections to replace H. Trendley Dean and Harold D. Lasswell, whose terms expired at the end of 1960.

Affiliates

Upon recommendation of the Committee on Affiliation and with endorsement by the Board of Directors, the Council elected the following organizations as affiliates of the AAAS: Idaho Academy of Science, American Society of Lubrication Engineers, American Society of Tool Engineers, National Federation of Science Abstracting and Indexing Services. These elections bring the number of affiliated organizations to 294. One affiliated society was dropped during the year.

Other Committees

The Council received from Barry Commoner, chairman of the Committee on Science in the Promotion of Human Welfare, both a printed and a verbal report extending the committee report published in *Science* [**132**, 68 (8 July 1960)]. Dr. Commoner described plans being made by the committee for its own future work, but made no recommendations to the Council. Council voted to accept the report and to express Council's appreciation and gratitude for the work of the committee and its substantive approval of the committee's plans.

The President called the roll of those of the Association's standing committees that had not already reported and invited such of the chairmen as cared to do so to make brief verbal reports.

Future Meetings

The Board reported that future meetings had been scheduled, for 1961 in Denver, 1962 in Philadelphia, 1963 in Milwaukee, and 1964 in Boston. On the advice of the Committee on Meeting Sites, the Board has requested the staff to seek suitable arrangements for 1965 on the Pacific Coast, for 1966 in the eastern part of the United States, and for 1967 in Dallas or another city in the Southwest. It was suggested that Montreal might be considered along with cities in the eastern part of the United States for the 1966 meeting. A question was raised from the floor as to whether the Board of Directors had, in making the above plans, kept in mind the principles expressed in the resolution concerning meeting sites adopted by Council following the 1955 meeting. The President replied that the Board had indeed kept those principles in mind.

Finances

Frederick P. H. Siddons, vice president of the American Security and Trust Company, who for 20 years has served as chairman of the AAAS Committee on Investment and Finance, reported on the management of the Association's investment funds during the past 20 years. In 1940 the investments of the Association had a book value of $235,000 and a market value of about $210,000. At the end of 1960, funds invested in stocks, bonds, and the land and building of the Association's headquarters had a market value of over $1,500,000.

In recognition of the service Mr. Siddons has given to the Association during 20 years of chairmanship of its Investment and Finance Committee, Council adopted the following resolution:

WHEREAS, for the past twenty years Mr. Frederick P. H. Siddons has served effectively and faithfully as chairman of the Investment and Finance Committee of the American Association for the Advancement of Science, and

WHEREAS, under his chairmanship the investment portfolio has been managed with skillful wisdom and with great benefit to the Association,

Now Be It Resolved, that the Association does hereby express to him its cordial best wishes and gratitude as well as its deep appreciation for two decades of devotion to its financial affairs.

The Executive Officer reported that preliminary estimates for 1960 showed an income of approximately $1,388,000 and expenses of approximately $1,238,000, each of these figures being approximately $200,000 above those for 1959. The excess of income over expenditures for 1960 was estimated to be approximately $150,000.

The following grants were received during 1960: $296,090 from the National Science Foundation in support of the traveling science libraries; $43,957 from the National Science Foundation for the selection of high school teachers to be awarded fellowships for graduate study in science or mathematics; $42,000 from the National Science Foundation for preliminary studies of possible improvements in the teaching of science in the elementary grades and junior high school; $30,000 from the National Science Foundation for a survey of the qualifications of a sample of secondary school science and mathematics teachers; $29,925 from the National Science Foundation to support the symposium on the sciences in Communist China; $83,333 from the Carnegie Corporation as the final portion of a three-year grant in general support of the Association's Science Teaching Improvement Program; $7500 from the Westinghouse Electric Corporation for the 1960 science writing awards; and $18,221 from various sources for the International Oceanographic Congress that was held in 1959.

On behalf of the Treasurer, the Executive Officer presented the budget shown in the accompanying table that had been approved by the Board of Directors for 1961.

Discussion

The President invited members to respond to the call for new business by discussing any matters of general concern to the Council or the whole Association, whether or not specific recommendations for action were submitted. Members made a variety of suggestions, which were recorded and later reported to the entire Council. The only recommendation calling for immediate action was a proposal of a resolution of warm appreciation to the local committees for the New York meeting for their hard and very effective work to make the meeting the excellent one it was. The resolution was adopted by acclamation.

AAAS Officers, Committees, and Representatives for 1961

The following persons are serving as officers, as members of the indicated committees, and as representatives to other organizations for the year 1961. The dates in parentheses indicate the year of expiration of terms of election or appointment.

General Officers

Retiring President and Chairman of the Board of Directors: Chauncey D. Leake (1961), Ohio State University

President: Thomas Park (1962), University of Chicago

President-Elect: Paul M. Gross (1963), Duke University

Other Members of the Board of Directors

Harrison Brown (1963), California Institute of Technology

Henry Eyring (1961), University of Utah

H. Bentley Glass (1962), Johns Hopkins University

Margaret Mead (1962), American Museum of Natural History

Don K. Price (1964), Harvard University

Alfred S. Romer (1963), Harvard University

William W. Rubey (1961), University of California, Los Angeles

Paul A. Scherer (ex officio), Research Corporation

Alan T. Waterman (1964), National Science Foundation

Dael Wolfle (ex officio), AAAS

Vice Presidents and Chairmen of the Sections

Mathematics: J. L. Walsh, Widener Library, Cambridge

Physics: Henry D. Smyth, Princeton University

Chemistry: Essie White Cohn, University of Denver

Astronomy: Robert M. Petrie, Dominion Astrophysical Observatory, Royal Oak, B.C., Canada

Geology and Geography: Richard J. Russell, Louisiana State University

Zoological Sciences: Jack Schultz, Institute for Cancer Research, Philadelphia

Botanical Sciences: James F. Bonner, California Institute of Technology

Anthropology: Jesse D. Jennings, Northwestern University

Psychology: Carl Pfaffmann, Brown University

Social and Economic Sciences: Frederick F. Stephan, Princeton University

History and Philosophy of Science: N. Russell Hanson, University of Indiana

Engineering: C. E. Davies, United Engineering Center Project, New York

Medical Sciences: John B. Youmans, American Medical Association

Alan T. Waterman

Dentistry: Harold J. Noyes, University of Oregon

Pharmacy: Joseph A. Oddis, American Pharmaceutical Association, Washington, D.C.

Agriculture: Wynne Thorne, Utah Agriculture Extension Station, Logan

Education: William H. Bristow, New York, N.Y.

Administrative Officers

Executive Officer: Dael Wolfle

Treasurer: Paul A. Scherer

Associate Administrative Secretary: Raymond L. Taylor

Editor: Graham DuShane

Business Manager: Hans Nussbaum

Director of Education: John R. Mayor

Director, Science Library Program: Hilary J. Deason

Director of studies on the public understanding of science: Edward G. Sherburne, Jr.

Secretaries of the Sections

Mathematics: Wallace Givens (1964), Northwestern University

Physics: Stanley S. Ballard (1963), University of Florida

Chemistry: S. L. Meisel (1964), Socony Mobil Oil Company

Astronomy: Frank Bradshaw Wood (1961), University of Pennsylvania

Geology and Geography: Richard H. Mahard (1964), Denison University

Zoological Sciences: George Wharton (1961), University of Maryland

Botanical Sciences: Harriet B. Creighton (1963), Wellesley College

Anthropology: James L. Giddings (1961), Brown University

Psychology: Frank W. Finger (1963), University of Virginia

Social and Economic Sciences: Donald P. Ray (1962), George Washington University

History and Philosophy of Science: John W. Streeter (1961), Chester Springs, Pa.

Engineering: Leroy K. Wheelock (1964), Engineers Joint Council, New York, N.Y.

Medical Sciences: Oscar Touster (1964), Vanderbilt University School of Medicine

Dentistry: Reidar F. Sognnaes (1962), Harvard School of Dental Medicine, Boston

Pharmacy: John E. Christian (1962), Purdue University School of Pharmacy

Agriculture: Howard B. Sprague (1961), Pennsylvania State University

Industrial Science: Allen T. Bonnell (1964), Drexel Institute of Technology, Philadelphia

Education: Herbert A. Smith (1963), University of Kansas

Officers of the Alaska Division

President: John P. Hannon, Arctic Aeromedical Laboratory, Ft. Wainwright

Vice President: Rachel S. Simmet, Arctic Health Research Center, Anchorage

Secretary: Eleanor G. Viereck, University of Alaska, College

Treasurer: Anne Sosnkowski, Alaska Historical Museum, Juneau

Executive Secretary: George Dahlgren, Jr., University of Alaska, College

Council Representative: Victor P. Hessler, Geophysical Institute, College

Officers of the Pacific Division

President: W. A. Clemens, University of British Columbia

President-Elect: Melvin Calvin, University of California, Berkeley

Retiring President: Henry P. Hansen, Oregon State College

Secretary: Robert C. Miller, California Academy of Sciences

Council Representative: Robert C. Miller

Officers of the Southwestern and Rocky Mountain Division

President: Alan T. Wager, Arizona State University

President-Elect: Anton H. Berkman, Texas Western College

Secretary: Marlowe G. Anderson, New Mexico State University

Council Representative: Marlowe G. Anderson

Editoral Board

Graham DuShane, AAAS, chairman

Konrad B. Krauskopf (1963), Stanford University

Edwin M. Lerner (1964), National Institutes of Health

Philip M. Morse (1965), Massachusetts Institute of Technology

H. Burr Steinbach (1963), University of Chicago

William L. Straus, Jr. (1963), Johns Hopkins Medical School

Edward L. Tatum (1962), Rockefeller Institute

Standing Committees

AAAS Cooperative Committee on the Teaching of Science and Mathematics

Thornton L. Page, Wesleyan University, chairman

Wayne Taylor, Michigan State University, vice-chairman

Bernard B. Watson, Operations Research Office, Johns Hopkins University, secretary

C. L. Agre, Augsberg College

J. W. Buchta, University of Minnesota

John W. Cell, North Carolina State College

Malcolm Correll, De Pauw University

H. S. Fowler, Pennsylvania State University

Alfred B. Garrett, Ohio State University

Arthur L. Howland, Northwestern University

Phillip S. Jones, University of Michigan

Robert T. Lagemann, Vanderbilt University

Ralph Lefler, Purdue University

Harry F. Lewis, Institute of Paper Chemistry, Appleton, Wis.

George G. Mallinson, Western Michigan University

John R. Mayor, AAAS

Bruce E. Meserve, Montclair State College

Fred H. Norris, University of Tennessee

W. E. Restemeyer, University of Cincinnati

Emery L. Will, State University Teachers College, Oneonta, N.Y.

Theodore Woodward, U.S. Department of Agriculture, Washington, D.C.

Dael Wolfle, AAAS, ex officio

AAAS Meetings

Allen T. Bonnell (1962), Drexel Institute of Technology, chairman

Horace R. Byers (1963), University of Chicago

Stanley A. Cain (1962), University of Michigan

Don K. Price

Frank Fremont-Smith (1962), AIBS Interdisciplinary Conference Program, New York, N.Y.

William C. Steere (1961), New York Botanical Garden

John R. Bowman, Northwestern University, ex officio

Barry Commoner, Washington University, ex officio

Warren Weaver, Alfred P. Sloan Foundation, ex officio

Dael Wolfle, AAAS, ex officio

Raymond L. Taylor, AAAS, staff representative

Affiliation

I. Melville Stein (1962), Leeds and Northrup Company, chairman

Earl L. Green (1961), Roscoe B. Jackson Memorial Laboratory

Luna B. Leopold (1965), U.S. Geological Survey

Rensis Likert (1964), University of Michigan

Paul B. Sears (1963), Yale University

Dael Wolfle, AAAS, ex officio

Raymond L. Taylor, AAAS, staff representative

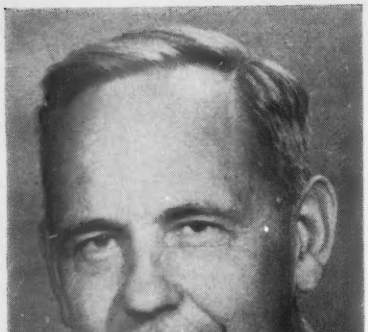
Cooperation among Scientists

John R. Bowman (1961), Northwestern University, chairman

Burton W. Adkinson (1963), National Science Foundation

Richard T. Arnold (1962), Mead Johnson and Company, Evansville

Frank Fremont-Smith (1965), AIBS Interdisciplinary Conference Program, New York, N.Y.



Henry Eyring

R. E. Gibson (1964), Johns Hopkins University Applied Physics Laboratory

H. Bentley Glass, Johns Hopkins University, ex officio, Board representative

Dael Wolfle, AAAS, ex officio

Council Affairs

Paul M. Gross (1961), Duke University, chairman, ex officio

Allan D. Bass (1963), Vanderbilt University School of Medicine

Stanley A. Cain (1961), University of Michigan

Barry Commoner (1962), Washington University

Alfred E. Emerson (1962), University of Chicago

Charles B. Hitchcock (1962), American Geographical Society, New York

Kenneth C. Spengler (1961), American Meteorological Society, Boston, Mass.

Warren Weaver (1963), Alfred P. Sloan Foundation

William A. Wildhack (1963), National Bureau of Standards

Frank Bradshaw Wood (1961), University of Pennsylvania

Dael Wolfle, AAAS, secretary, ex officio

Executive Committee of the Board of Directors

Chauncey D. Leake, chairman

Paul M. Gross

Thomas Park

Paul A. Scherer

Alan T. Waterman

Dael Wolfle

Investment and Finance

F. P. H. Siddons (1962), American Security and Trust Company, Washington, D.C., chairman

Sheldon B. Akers (1961), Brookings Institution, vice chairman

Wallace R. Brode (1964), Washington, D.C.

J. E. Graf (1965), Washington, D.C.

Malvern F. Morse (1963), American Security and Trust Company

Paul A. Scherer, Research Corporation, ex officio

Dael Wolfle, AAAS, ex officio

Hans Nussbaum, AAAS, staff representative

Nominations and Elections

Thomas Park (1961), University of Chicago, chairman

David R. Goddard (1961), University of Pennsylvania

Paul M. Gross (1962), Duke University

Herbert E. Longenecker (1961), Tulane University

Howard A. Meyerhoff (1961), Scientific Manpower Commission

(Two more to be selected)

Public Understanding of Science

Warren Weaver (1963), Alfred P. Sloan Foundation, chairman

Willard Bascom (1961), National Academy of Sciences

Victor Cohn (1962), Minneapolis *Star and Tribune*

Laurence M. Gould (1964), Carleton College

Richard D. Heffner (1965), CBS Television Network, New York, N.Y.

Thomas Park, University of Chicago, ex officio, Board representative

Dael Wolfle, AAAS, ex officio

Publications

H. Bentley Glass (1961), Johns Hopkins University, chairman

George R. Harrison (1965), Massachusetts Institute of Technology

Chauncey D. Leake (1964), Ohio State University

Thomas Park (1962), University of Chicago

Ralph R. Shaw (1963), Rutgers University

Dael Wolfle, AAAS, ex officio

Graham DuShane, AAAS, staff representative

Science in the Promotion of Human Welfare

Barry Commoner (1962), Washington University, chairman

Robert B. Brode (1963), University of California, Berkeley

T. C. Byerly (1962), Agricultural Research Service, Department of Agriculture, Washington, D.C.

Lawrence K. Frank (1963), Belmont, Mass.

H. Jack Geiger (1962), Harvard Medical School, Boston

Frank W. Notestein (1961), Population Council, Inc., New York, N.Y.

Walter Orr Roberts (1961), University Corporation for Atmospheric Research, Boulder, Colo.

Margaret Mead, American Museum of Natural History, ex officio, Board representative

Dael Wolfle, AAAS, ex officio

Special Committees

AAAS-Campbell Award for Vegetable Research, Judges

Louis P. Reitz (AAAS Section on Agriculture), Agricultural Research Service, Beltsville, Md., chairman

Sterling B. Hendricks (American Society of Plant Physiologists), Plant Industry Station, Beltsville, Md.

Iver J. Johnson (American Society of Agronomy), Caladino Farm Seeds, Inc., Wheaton, Ill.

F. F. Smith (Entomological Society of America), U.S. Department of Agriculture, Entomology Research Branch, Beltsville, Md.

F. C. Stark, Jr. (American Society for Horticultural Science), University of Maryland, College Park

G. Ledyard Stebbins, Jr. (Genetics Society of America), University of California, Davis

E. E. Wilson (American Phytopathological Society), University of California, Davis

AAAS Newcomb Cleveland Prize, Judges

Alfred E. Emerson, University of Chicago, chairman

Wallace R. Brode, Washington, D.C.

Chauncey D. Leake, Ohio State University

Gairdner B. Moment, Goucher College

Conrad Mueller, Columbia University

Thomas Park, University of Chicago

William W. Rubey, University of California, Los Angeles

Paul B. Sears, Yale University

Howard B. Sprague, Pennsylvania State University

Frank Bradshaw Wood, University of Pennsylvania

AAAS Socio-Psychological Prize
Donald P. Ray, George Washington University
Frederick F. Stephan, Princeton University
Dael Wolfle, AAAS

AAAS-Westinghouse Science Writing Awards, Managing Committee
Graham DuShane, AAAS, administrator
Jules B. Billard, *National Geographic* Magazine
Charles N. Fry, Westinghouse Electric Corporation
Harry R. Gail, Westinghouse Electric Corporation
Nate Haseltine, Washington *Post and Times Herald*
Hans Nussbaum, AAAS
Edward G. Sherburne, Jr., AAAS

Popular Science Books
Harrison Brown, California Institute of Technology
Barry Commoner, Washington University
E. U. Condon, Washington University
Kirtley F. Mather, Harvard University

Retirement Plan (must be composed of three staff members)
Dael Wolfle, AAAS, chairman
Hans Nussbaum, AAAS
Raymond L. Taylor, AAAS

Committees To Be Appointed

AAAS Socio-Psychological Prize, Judges
AAAS-Westinghouse Science Writing Awards, Screening Committee
AAAS-Westinghouse Science Writing Awards, Judges
Theobald Smith Award in the Medical Sciences, Judges

Representatives

Advisory Council on Medical Education
Lowell T. Coggeshall, University of Chicago

American Council on Education
Mark H. Ingraham, University of Wisconsin
John R. Mayor, AAAS

American Standards Association Sectional Committee on Fluid Permeation (Z59)
M. King Hubbert, Shell Oil Company, Houston

American Standards Association Sectional Committees on Letter Symbols and on Abbreviations for Science and Engineering (Y1 and Y10)
Irving P. Orens, Newark College of Engineering

American Standards Association Sectional Committee on Preferred Practice for the Preparation of Graphs, Charts, and Other Technical Illustrations (Y15)
Everett T. Burton, Battle Creek, Mich.

American Standards Association Sectional Committee on Use of the Decimalized Inch (B87)
Carl F. Kayan, Columbia University

Council of National Organizations of the Adult Education Association of the United States
John R. Mayor, AAAS

Committee on the Kimber Genetics Award of the National Academy of Sciences
Tracy M. Sonneborn, Indiana University

Council of Old World Archeology
Richard K. Beardsley, University of Michigan

Instrument Society of America Committee on Research and Development
Jesse W. Beams, University of Virginia

Joint Commission on Mental Illness and Health
Ernst Mayr, Museum of Comparative Zoology, Harvard College

National Conference on FAO
Noble Clark, University of Wisconsin

Office of Critical Tables Advisory Board, National Academy of Sciences
Wallace R. Brode, Washington, D.C.

Science Service Board of Trustees
Wallace R. Brode (1963), Washington, D.C.
William W. Rubey (1962), University of California, Los Angeles
Douglas M. Whitaker (1961), Rockefeller Institute

Scientific Manpower Commission
Wallace R. Brode (1961), Washington, D.C.
M. H. Trytten (1963), National Academy of Sciences

U.S. Committee on ISO Technical Committee 37—Terminology
Duane Roller, Harvey Mudd College

U.S. National Commission for UNESCO
S. S. Wilks, Princeton University

A Report of the Eighth New York Meeting

Raymond L. Taylor

The eighth New York meeting proved to be the largest meeting the AAAS has ever held. There were 7389 paid registrants, so that even the previous record-breaking meeting of 1949, which had 7014 registrants, was surpassed.

This new high in registration is particularly striking in view of the fact that it was not due to the same circumstances that made the 1949 meeting so exceptional. At that sixth New York meeting the many biological societies that now regularly prefer a summer, or a campus, meeting made up the major portion of the attendance. All the mathematical societies were also present, and in addition (and quite unusually), groups of sociologists, including the American Sociological Association, held their national meetings with the AAAS that year.

By comparison, at the eighth New York meeting, seven biological societies, with some 78 sessions and 347 speakers, contributed substantially but did not dominate the meeting. There were symposia and programs specially arranged by other AAAS affiliates that, in the aggregate, contributed materially. Finally, the symposia and other sessions of the 18 sections, of AAAS committees and conferences, and of the Association as a whole have all grown in quality and attractiveness.

As is true with scientific meetings generally, the annual meetings of the Association have tended to grow in size as the scientific population has increased, but this is not particularly apparent unless they are studied by decades. Between World Wars I and II, just five AAAS meetings had 3000 or more registrants; the largest of these was the Washington meeting of 1924, with 4206 registrants. Of the 16 meetings since 1945, ten have exceeded 3000 registrants. The six largest were the two Chicago meetings of 1947 and 1959 (with registration totals of 4940 and 4636, respectively); the 1956 New York meeting (5327); the 1958 Washington meeting (5368); the 1949 New York meeting (7014); and now the 1960 meeting (7389).

Mere size, however, is not the best criterion of a successful meeting. Rather, it is the quality of the programs, the importance of the business transacted, and the impact and stimulus of the conversations exchanged that make a scientific meeting significant and memorable. These considerations and the size of the meeting, of course, are positively correlated.

It was apparent early in 1960, from the developing programs, that the 127th meeting almost certainly would have several thousand more registrants than the large meetings of the past three years. Prospective exhibitors heeded this prediction, and the original exhibit area was sold out months in advance of the opening day. Throughout the fall, advance registration was heavier than ever before; more than 2100 registered before the meeting began. When the last registration slip had been counted, it was found that, for the second time, the number of paid registrants, usually in the range of 5000, had exceeded 7000.

Fortunately, the over-all capacity of the Grand Central Zone hotels was now such that no serious congestion, like that of 1949, developed. Nor was it necessary, as it was then, to hold one-third of the daytime sessions at Columbia University. Also, it was possible to schedule more programs in the first two days of the week.

Most of the sessions had rooms of appropriate size, and almost every program had at least as large an audience as had been anticipated; indeed, there were instances where sessions overflowed—an obvious tribute to their quality. This is almost inevitable when program chairmen have been too modest in their estimates of attendance, or when added sessions are interpolated after all large session rooms have been assigned.

The demand for projection facilities was heavy, but it was possible to meet last-minute requests because the Committee on Physical Arrangements wisely had provided extra equipment and not only had scheduled an operator for every session that had originally requested lanterns but had projectionists in reserve. Such aspects of the meeting as registration, traffic in the exhibit and Science Theatre areas, and the various social functions, in general, went smoothly.

The four hotels that housed the 18 sections and the 91 participating organizations were so near to one another that, it is believed, virtually all registrants saw the exhibits at least once. Incidentally, the now-established policy of restricting admission to the Exposition to those with registration badges, and of registering no one younger than 16, met with approval from all but a few disappointed parents who felt that the rules should be waived for their exceptionally talented young children. No exceptions, however, were authorized. Most people realized that the exhibits were designed for professional scientists and other science-minded adults. This policy does not imply any lack of interest on the part of the Association in science-minded young people. The separate Junior Scientists Assembly, arranged by the Association's Academy Conference, and the Science Library Program (now modified for, and circulated to, elementary schools as well as high schools) provide ample evidence to the contrary.

The New York meeting's total of 352 sessions, summarized in Tables 1, and 2, included programs sponsored by the Association as a whole, by all 18 AAAS sections, by two AAAS committees, by four recurrent conferences, and by 48 societies that arranged programs varying from 1 to 36 sessions in length. In addition, there were 37 *other* participating organizations that officially cosponsored programs of appropriate sections and societies.

Since all 18 AAAS sections had programs, there were sessions of interest to specialists in all the principal fields of science as well as interdisciplinary symposia for those aware of the contributions that one science may make to another. There were some 39 luncheon or dinner or other social functions, exclusive of small private parties. The trailer with the many books for the book lounge of the So-

ciety of Systematic Zoology was snowbound in Illinois, but the demonstration room of the American Society of Zoologists, the room of Sigma Delta Epsilon, and other headquarters rooms where business meetings, conferences, or spontaneous discussions could be held in comfort were welcome features of the meeting.

The AAAS had two headquarters hotels. The Biltmore was the site of the Annual Exposition of Science and Industry, the Science Theatre, the Visible Directory of Registrants, and the AAAS Office. Located at the Commodore were the business sessions of the Association, most of the large evening events, the general events, and the AAAS pressroom. In general, these two hotels housed the biological and medical groups, including the many sessions of the zoologists; the Roosevelt housed the American Astronomical Society, the sessions on education, the science teaching societies, and the series of societies in the economic and social sciences; the geologists, the geographers, the anthropologists, and the History of Science Society and other Section L affiliates were based at the Belmont Plaza; and the American Society of Criminology and a number of the geographical sessions were quartered at the Waldorf-Astoria. The facilities and location of these hotels made for a particularly convenient meeting. Indeed, by using the underground concourse of Grand Central Station it was possible to walk between the Biltmore, the Commodore, and the Roosevelt without hat or coat.

Arrangements for the Meeting

Compliments on the physical arrangements for the 127th AAAS meeting have been numerous—but not unanimous. No meeting as large and uniquely complex as a AAAS meeting can be entirely without problems or minor frustrations. That the meeting presented no serious difficulties and was as smooth-running and pleasant as it was is a tribute to many individuals—from program chairmen, research scientists, teachers, and AAAS office personnel to skilled workmen, porters, and students. Literally hundreds of persons, in one way or another, contributed their thought and services.

In general, the hotels had enough session rooms of the right sizes, and these were adequately furnished and equipped. The hotel personnel, from managers to bellboys, were capable and cooperative. There were no known instances of failure of microphones, and nearly all the projection facilities worked smoothly. Comments on this latter phase have ranged from "abominable" to "superb," but on the whole, a difficult job was done in adequate-to-superior fashion.

Table 1. Analysis of sessions at the eighth New York meeting.

Sessions for symposia, invited papers, and panels	152
Sessions for contributed papers	57
Sessions for addresses or lectures	29
Business sessions	51
Meals and social functions	39
Tours and field trips	8
Sessions for motion pictures	10
Demonstration periods	6
Junior scientists assembly	1
Total number of sessions	353

The local Committee on Physical Arrangements always has one of the most taxing assignments. For the New York meeting, well over 200 sessions required one or more types of lanterns and an operator. The basic equipment used (all borrowed) was as follows: 44 2- by 2-inch projectors, 45 standard lanterns, five opaque projectors, and 27 16-millimeter motion-picture projectors. Relatively few of the hotel rooms had screens in their session rooms, so 48 screens, ranging in size from 4 by 5 feet to 6 by 6 feet, were brought in. In addition, five large beaded screens, ranging from 8 by 10 feet to 14 by 16 feet, were rented for the larger rooms. Some flashlight pointers and slide adapters were also assembled. Most of the equipment came from the Board of Education of the City of New York, but New York University, Hunter College, Brooklyn College, Queens College, and Long Island University also contributed.

In each hotel there were rooms for the storage and distribution of lanterns and the assignment of operators. Projection operation was also the responsibility of the local committee, under the direction of Harry A. Charipper (head of the department of biology, New York University) and cochairman Samuel Schenberg (supervisor of science, Board of Education of the City of New York). Professional projectionists serviced the Science Theatre and the larger sessions, but a large part of the operation was handled principally by volunteer science students.

Projection requirement forms were issued in September and collated in October and November, so that the Committee on Physical Arrangements could know how many lanterns and screens would be needed, could plan for the collection, storage, and utilization of equipment as needed, and could recruit operators. Invariably there are last-minute requests for projection facilities, but seldom are there as many as there were at the 1960 meeting. The Committee received no less than 65 to 70 unexpected requests for projection equipment after the meeting had started —a new high for such requests and still another record-breaking aspect of the meeting.

The magnitude of the debt of all the participants to all members of the Committee on Physical Arrangements and their projectionists is apparent. I herewith express the deep appreciation of the staff of the Association.

Housing and registration were ably handled by experienced staff members of the New York Convention Bureau. I am indebted to the heads of these departments—Miss Sylvia Peltonen and Mrs. Myrtle Nicholas, respectively—and to Mrs. Margaret Jedlicka, who supervised the activities of the registration clerks. I am also greatly indebted to Royal W. Ryan and Walter R. Potts, executive vice president and convention

Table 2. Comparison of AAAS-sectional programs and society programs.

Session	AAAS, its sections, committees, and conferences	Participating societies	Total number of sessions with papers	Total number of speakers
Sessions for symposia, invited papers, panels	69 (399 speakers)	83 (439 speakers)	152	838
Sessions for contributed papers*	13 (91 papers)	44 (372† papers)	57	463
Sessions with addresses or lectures‡	20 (35 speakers)	26 (41 speakers)	46	76
Total			255	1377

* Each paper is assumed to have been presented by a single speaker. † The figure does not include 51 papers read only by title. ‡Addresses at meal functions are included.

manager, respectively, of the New York Convention and Visitors Bureau, for their invaluable advice and assistance before and during the meeting.

The layout of booths on the ballroom floor of the Biltmore was arranged by Show Services, Inc., who handled the layout in 1956. Since Monday, 26 December, was a legal holiday, labor, even at double and triple wages, was in short supply. The ballroom, the foyer, the other rooms, and the relatively narrow corridors on this 19th floor were a scene of confusion from 3:00 A.M. on. Decorations for a wedding reception had to be removed, electric cables for outlets for the 120 booths had to be laid, and the booths had to be set up. Then came the delivery of the exhibitors' crates and smaller packages. From the street level these were brought through a crowded and undermanned receiving department and then upstairs by means of one set of slow-moving freight elevators. After the crates had been delivered they had to be unpacked and removed. Not until the corridors were clear could the Visible Directory of Registrants be installed. At last the aisles were cleared and cleaned, the directional signs were hung, and the furniture for the booths was delivered. Somehow, almost miraculously, almost every booth was manned and functioning by 7 P.M. the first evening. But there were some freight and express shipments that had been misrouted or caught in the holiday holdup. A few parts of exhibits did not come until January, days after the Exposition had closed.

The professional guard service supplied men who did their jobs with understanding and courtesy. The AAAS office, the AAAS pressroom, the two information centers, and the AAAS booth were principally manned by AAAS staff members who had come from the Washington office between 21 and 25 December. In addition, there were volunteers from the Committee on Physical Arrangements and the McCann-Erickson organization, two representatives from the New York advertising office of *Science*, and several friends from out of town who dropped in to give their time for anywhere from an hour to several days. We are grateful to all of them for their devoted services, which so greatly contributed to the meeting's success.

Registration slips were collected from four registration points at intervals throughout each day. The slips were sorted into alphabetical order and carefully posted in the Visible Directory of Registrants in two corridors of the exhibit area. Paid workers and volunteers handled the posting, and a graduate student was engaged to answer the Directory telephone. These workers and volunteers also assisted registrants in locating names or adding hotel-room data to their slips. For the first time, the capacity of the Directory appeared to be inadequate, and three additional sets of Kardex pockets had to be inserted.

Pattern of the Meeting

Since its formation in 1955, the Association's Committee on Meetings has devoted much thought to the arrangement of the general events, the interdisciplinary symposia, and the distinguished evening lectures throughout the meeting. The section secretaries now meet jointly with the committee early in the year and often reflect the needs and views of the participating societies.

The pattern that was adopted for the 1960 meeting was the most successful yet. The two parts of the "Moving Frontiers of Science" program—in which able specialists interpret some of the more recent findings in their fields in terms intended to interest and inform all scientists—were scheduled on the first night and the third afternoon. Three strong interdisciplinary programs (in the physical, biological, and social sciences, respectively), in which sections and societies may cooperate, were scheduled concurrently on the third morning. The second evening was reserved for some exceptional event, and the fourth evening, "Honor Societies Night," was reserved for the joint address of the Society of the Sigma Xi and the United Chapters of Phi Beta Kappa and for the second annual address of the Tau Beta Pi Association.

With the three interdisciplinary symposia in the morning, part 2 of "Moving Frontiers of Science" in the afternoon, and the AAAS presidential address in the evening, Wednesday, 28 December, became "AAAS Day." Division of the week in this manner facilitated the scheduling of programs of appropriate length in two two-day blocks (26–27 and 29–30 December, respectively) by the sections and societies. The results were less demand for session rooms on one or two peak days in the middle of the week, fewer conflicts between programs of interest to the same potential audience, and, in general, more time for people to see each other.

There was balance between programs of appeal to specialists, programs in interdisciplinary areas, and programs concerned with matters of import for all scientists. In addition, there were sessions for the science-minded public, and there was an afternoon event—the 14th Junior Scientists Assembly—especially for high school science students.

There was also an excellent balance among the physical, biological, social, medical, and other sciences. In general, the multisessioned programs of 18 different sections ensure that no principal field of science is neglected, and the sectional programs expand or contract according to the number and identity of the societies that meet with the AAAS in a particular year.

Within the limits of the available physical facilities, societies affiliated with the AAAS are welcome to meet with the Association on any scale they wish—in a full national meeting, in a special or regional meeting, or simply as cosponsors of a program arranged by a section or another society. There is a tendency for more societies to participate each year (91 such organizations took part in the New York meeting), but, typically, no one society's meeting requires an excessively large number of session rooms at one time, nor does any large bloc of societies within one discipline take up a disproportionate part of the entire program. Most of the societies find it possible to keep free, for the general events, the same portions of the meeting period that the sections do.

Highlights of the Meeting

One program that started promptly on the morning of 26 December, and attracted world-wide attention, was the four-session symposium, "The Sciences in Communist China," sponsored jointly by the Conference on Scientific Communication and the AAAS as a whole and cosponsored by the National Science Foundation and ten major scientific organizations. National Science Foundation grants paid for all the laborious work of making microfilm reprints and for translations, where necessary, of ten years' files of Chinese scientific journals and covered other expenses connected with the bringing

of some 28 experts to New York for two days. The cosponsoring societies were the American Chemical Society, American Geological Institute, American Geophysical Union, American Institute of Biological Sciences, American Institute of Physics, American Mathematical Society, American Meteorological Society, Engineers Joint Council, Federation of American Societies for Experimental Biology, and Social Science Research Council. Since George R. Harrison was unable to preside as scheduled, Elmer Hutchisson (American Institute of Physics) and Douglas Whitaker (Rockefeller Institute) consented to chair the sessions of the first and second days, respectively. The papers of the four sessions will appear as a AAAS symposium volume as soon as editing, typesetting, and binding permit.

Another program that began the first morning of the meeting was that of the Section on Medical Sciences, a five-session symposium on "Biophysics of Physiological and Pharmacological Actions."

The four invited lectures of "Moving Frontiers of Science" are discussed below, under "AAAS General Symposium."

On the second evening, Sir Charles P. Snow (British scientist-novelist and visiting professor of English at the University of California, Berkeley) addressed a capacity audience in the large ballroom of the Commodore, after an introduction by the presiding chairman, Warren Weaver. The Reverend Theodore M. Hesburgh (president of the University of Notre Dame) and W. O. Baker (vice president-research, Bell Telephone Laboratories) commented. This program has already appeared in *Science* [**133**, 255 (27 Jan. 1961)].

Concurrently, the first George Sarton Memorial Lecture, endowed by the George Sarton Memorial Foundation, was given by Rene Dubos of the Rockefeller Institute before an audience that filled the Baroque Room of the Belmont Plaza.

On Honor Societies Night, 29 December, the annual joint address of the Society of the Sigma Xi and the United Chapters of Phi Beta Kappa was given by Polykarp Kusch (Nobel prize winner and professor of physics, Columbia). He was introduced by Mina Rees, and his address, "Scientists and laymen," was heard by an appreciative audience. The concurrent address, "The increasing significance of energy in an expanding world," given under the auspices of the Tau Beta Pi Association by Walker Lee Cisler (president, Detroit Edison Company, and president, American Society of Mechanical Engineers), deserved a larger audience.

The annual illustrated lecture and film of the National Geographic Society ("Finding the World's Earliest Man"), presented on 30 December by Matthew W. Stirling, member of the NGS Committee for Research and Exploration, concluded the week's impressive list of special sessions.

Fourteen of the 18 AAAS sections sponsored vice-presidential addresses (one of these was cancelled with cancellation of the physicists' luncheon), and other presidential addresses were given under the auspices of the participating societies. Most of these are mentioned in the separate reports which appear elsewhere in this issue (page 482). Other highlights of this year's meeting were the general sessions and the AAAS Presidential Address and Reception.

AAAS Presidential Address and Reception

On the customary evening, 28 December, the traditional address of the retiring (112th) president of the Association, Paul E. Klopsteg, was given before an audience that nearly filled the large Grand Ballroom (capacity 2000) of the Commodore Hotel. President Chauncey D. Leake presided and introduced Eger V. Murphree (president, Esso Research and Engineering Company), general chairman of the eighth New York meeting, who graciously welcomed all registrants to the scientific community of New York. Also introduced were Sir George V. Allen, secretary of the British Association for the Advancement of Science, and Edward Anders (associate professor, department of chemistry and Enrico Fermi Institute, University of Chicago), winner of the Newcomb Cleveland Prize for his paper "Meteorites and asteroids," given before the Section on Astronomy at the 1959 AAAS meeting of the Association. Retiring president Klopsteg's scholarly paper, "The indispensable tools of science," has already been published [*Science* **132**, 1913 (30 Dec. 1960)].

Members of the platform party included all those mentioned above and all but two members of the Board of Directors, Dael Wolfle and Raymond Taylor. The AAAS reception which followed was well attended. The receiving line included members of the platform party and a number of their wives. For those in the receiving line, it was, as always, a pleasure to be able to greet so many members and friends of the Association.

AAAS General Symposium

The general symposium of the Association, "Moving Frontiers of Science V," planned annually by the Committee on AAAS Meetings, was held the evening of 26 December and the afternoon of 28 December in the Grand Ballroom of the Commodore Hotel. Part 1 consisted of two lectures, "Recent work on meteorites," by Edward Anders, and "Development of present concepts of the organization of the brain," by H. W. Magoun (professor of anatomy, University of California, Los Angeles).

In the second session, George Wald (professor of biology, Harvard) spoke on "The molecular basis of vision" and Herman H. Goldstine (Lamb Estate Research Center, IBM Corporation), on "Recent developments and the current status of information theory." Thomas Park, president-elect of the Association, presided at both sessions. It is expected that all of these addresses will appear in *Science*.

Other AAAS General Sessions

For the first time, as planned by the Committee on Meetings and the section secretaries, the morning of 28 December, "AAAS Day," was reserved primarily for the three interdisciplinary symposia mentioned above, held concurrently. Details of these excellent, well-attended programs are given below.

The interdisciplinary symposium in the physical sciences, "Plasma—The Fourth State of Matter," was the joint program of the AAAS sections on Physics and Astronomy, cosponsored by the American Astronomical Society, Sigma Pi Sigma, and the Division of Plasma Physics of the American Physical Society and arranged by Stanley S. Ballard (University of Florida). Lyman Spitzer, Jr., (Princeton) pre-

sided, and the speakers were Melvin B. Gottlieb, Stirling A. Colgate, and James A. Van Allen.

The interdisciplinary symposium in the biological sciences, "Life under Extreme Conditions: Human Studies," was the program of the AAAS Section on Zoological Sciences, cosponsored by the American Society of Zoologists and arranged by J. P. Marbarger (University of Illinois), who also presided. The speakers were Hubertus Strughold, Fred A. Hitchcock, James D. Hardy, and Steven M. Horvath.

The interdisciplinary symposium in the social sciences, "The Urban Frontier: A Conquest of Inner Space," was the joint program of the AAAS sections on Geology and Geography, Social and Economic Sciences, Agriculture, and Industrial Science and the Association of American Geographers. Charles C. Morrison, Jr. (American Geographical Society), Firman E. Bear (Rutgers), and Frank C. Whitmore, Jr., (U.S. Geological Survey) arranged the program. James E. Lash (Action, Inc.) presided, and the speakers were A. Ross Eckler, Martin Millspaugh, Coleman Woodbury, Dorothy A. Muncy, Paul Busse, and George M. Raymond.

The Association is deeply grateful to all who prepared papers for these and also for the other, more specialized, symposia.

On the afternoon of 26 December, the AAAS Committee on Science in the Promotion of Human Welfare sponsored a symposium, "The Scientist's Role in the Community: New Responsibilities in the Nuclear Age," that attracted a large attendance. Committee member Margaret Mead presided. The speakers were Edward Baylor, Jules Hirsch, Barry Commoner, Irving Michelson, and David Barry, and discussants were Judson Hardy and Victor Cohn.

Another symposium of this committee was "Psychological and Sociological Implications of Nuclear Arms"; Harold Lief presided, and Kenneth E. Boulding, Jerome D. Frank, Ralph E. Lapp, and Charles Osgood spoke. The Committee held two open hearings—one on problems related to the expansion of medical research, the other on the effects of the present status of science on the integrity of science.

The AAAS Cooperative Committee on the Teaching of Science and Mathematics had two well-attended sessions, both arranged by John R. Mayor. One was on "Progress in Teacher Certification in Science," the other, on "Science Education in the Elementary and Junior High Schools."

Other Symposia

At AAAS meetings, for the past ten years, there has been an increasing emphasis on symposia and a relative reduction in the number of sessions for contributed papers, on the part both of sections and of participating societies. At the eighth New York meeting, six sections and societies had a total of 57 sessions for submitted short reports of current research. (The American Society of Zoologists, alone, had 19 such sessions, with 163 papers.) In contrast, however, the AAAS, its sections and two committees, and the participating organizations sponsored a grand total of 152 sessions for symposia (of one to six parts), panels, or groups of invited papers on chosen subjects. In planning these symposia, more and more care is given to choice of topic, selection of speakers, and provision for discussion.

As Table 1 shows, there were almost three times as many sessions devoted to programs of the symposium type as to sessions for contributed papers, although 25 organizations were holding national meetings with the Association. The total of 838 symposium participants markedly outnumbered the 539 other speakers.

Conferences

At each AAAS meeting four recurrent conferences are held. The Academy Conference, composed of the official delegates of the 46 (now 47) academies of science affiliated with the Association and of others interested in academy affairs, after an afternoon session on junior academies, arranged by E. M. Gurr (Central High School, Phoenix, Arizona), had a day of sessions which included routine reports and business, a panel discussion on "The Utilization of National Science Foundation Grants by the Academies of Science," and a dinner at which John G. Arnold, Jr., (Loyola) gave the Academy Conference presidential address.

The 14th annual Junior Scientists Assembly—a program especially for high school students, sponsored by the Association through the Academy Conference—arranged by Evelyn Morholt (Fort Hamilton High School, Brooklyn), consisted of an afternoon session, 27 December, in the auditorium of the American Museum of Natural History. Selected projects and exhibits were on display. The program is reported in this issue, in reports of sections and societies (X1), by Miss Morholt, to whom the Academy Conference and the Association are much indebted.

The two-day joint program of the Conference on Scientific Communication and of the AAAS, with 11 cosponsors, on "The Sciences in Communist China," was mentioned above.

The program of the Conference on Scientific Manpower, cosponsored by the Engineering Manpower Commission, the Scientific Manpower Commission, the National Research Council, the National Science Foundation, and the AAAS Section on Engineering and arranged by a committee of which Thomas J. Mills (National Science Foundation) was chairman, consisted of five invited papers on "Developing Student Interest in Science and Engineering." It is described in the reports of sections and societies (X7).

The Conference on Encouraging the Participation of Women in Science, again jointly sponsored by the American Council on Women in Science and Sigma Delta Epsilon, was held 27 December. Mary Louise Robbins (George Washington School of Medicine), John R. Cortelyou (De Paul), and Margaret Mead (American Museum of Natural History) each spoke; after the addresses there was spirited general discussion.

AAAS Business Sessions

As required by the constitution, the Association's board of directors held its fourth regular meeting of the year at the annual meeting. Two of the sessions, as usual, preceded the two sessions of the Council (27 and 30 December), which are reported elsewhere in this issue. It is gratifying to note that the Council sessions were well attended and that four past presidents of the Association were present. The AAAS section officers' luncheon and business meeting, held on 28 December, was also well attended. Three AAAS presidents and several members of the

Committee on AAAS Meetings were present, to hear a brief survey of plans for this year's Denver meeting.

Smokers

The traditional Section E Smoker for geologists and geographers was held the evening of 27 December, and the AAAS Smoker for all registrants was held the evening of 29 December, immediately after the joint address of the Society of the Sigma Xi and the United Chapters of Phi Beta Kappa. The crackers and cigarettes on the tables at the entrances to the east and west ballrooms were donated by the National Biscuit Company and Philip Morris, Inc. The Association gratefully acknowledges these generous and recurrent donations. It had been hoped to have free Coca-Cola as in former years, but though free "cokes" had been available each day at the Biltmore, at the Annual Exposition of Science and Industry, it was found that distribution of free "cokes" was not feasible at the Commodore because of an unresolved problem of corkage. The Commodore contributed the labor to unpack the crackers and to dispense water. (In earlier days, beer and ale were donated for the Association's Smoker, but the pyramiding number of requests and the complication of state and local taxes have made gratuitous distribution of such beverages difficult, and it has been discontinued. It is hoped, however, that this may not always be the case.)

Attendance

As mentioned early in this report, in number of registrants (7389) the eighth New York meeting was the largest in the 113-year annals of the Association. The number of paid registrations exceeded those of the previous record-breaking meeting of 1949. It was also pointed out that, in general, AAAS meetings are getting larger. To date, though only 15 of the 127 AAAS meetings have had more than 3000 registrants, nine of these 15 have been meetings held in the past 12 years. With its present pattern of strong sectional symposia and other AAAS features and the varied and attractive programs arranged by the many participating societies, the Association should be able to count on its meetings being well attended wherever they are held.

Moreover, it is always true that the total attendance at any national meeting of the Association is greater than the number of registrants, since all programs and most events are open to everyone. This year nearly 100 percent of the professional scientists and teachers registered. Incidentally, members of the American Astronomical Society paid a "double registration"—the regular AAAS registration of $3 plus a record fee of like amount for the Society. The History of Science Society had its own registration, but many of its members also registered with the AAAS. These latter are included in the total AAAS registration.

In addition, however, there are always several thousands of science-minded members of the general public who attend the evening lectures or some other event who do not register at all. Even a technical program for specialists may be attended by several times the number of individuals registered for that discipline (see Table 3). It is probable that at the New York meeting at least an additional 5000 individuals attended one or more of the 353 sessions. Finally, the registration total of 7389 does not include 23 guests, 456 individuals connected with the exhibits, and 362 press representatives.

As Table 4 shows, 2896 registrants, or almost exactly 40 percent, came from New York State. On the basis of an analysis of registration made at the previous New York meeting, it may be estimated that some 1943, or about 26 percent, were from New York City itself and that registrants from the nearby suburban counties of Westchester, Nassau, and Hudson (in New Jersey) can be estimated to have totaled about 500. Thus, about one-third of the total registration came from metropolitan New York—the nation's most populous educational and scientific center—and the remaining two-thirds came from areas beyond convenient commuting distance. Except for Alaska, Idaho, and Nevada, each of the 50 states in the nation was represented. There were 85 registrants from Canada, and there were 43 scientists who represented 25 other countries. Most, but not all, of these were visiting scholars at American institutions.

The large attendance from so many geographical areas and the excellent representation at programs of each of the sections again demonstrated that, when programs of the symposium type are well chosen with respect to subject and are of high quality, a gratifying number of scientists and members of societies not meeting with the Association will travel long distances to attend them.

Table 3 shows an analysis of the 7389 registrants by subject fields, except for 412 instances where the "field of interest" line on the registration slip was left blank and where no other clues were available. Undoubtedly some of those who gave no field of interest were individuals who had registered hastily on their way to programs for which they were late. Of the remainder, 132 were wives of registrants. Between 400 and 500 wives attended the meeting, but many of these listed scientific interests. The "sciences in general" category includes a sub-

Table 3. Registrants by subject fields.

Mathematics and computers	199
Physical sciences	
Physics	282
Astronomy and astrophysics	267
Space science	62
Chemistry (other than medical)	460
Geology	213
Geography	92
Engineering	182
Industrial science	38
Biological sciences	
Botanical sciences	219
Ecology	141
Evolution	30
Genetics	145
Microbiology	68
Zoological sciences	698
Biology (in general, and other)	661
Medical sciences	
Bacteriology	18
Biochemistry (including nutrition)	271
Clinical chemistry	29
Biophysics (including muscle physiology)	69
Neurophysiology	30
Physiology (in general, and other)	271
Psychiatry	130
Pharmacology	76
Pharmaceutical sciences	147
Dental research	57
Medicine (in general, and other)	490
Social and economic sciences	
Criminology	20
Economics and sociology	170
Land use, city planning, and agriculture	120
Anthropology and archeology	135
Psychology	334
History and philosophy of science	99
Science teaching	197
Education	207
Sciences in Communist China	66
Sciences in general and administrative	284
Wives (fields unspecified)	132
Students (fields unspecified)	84
No field indicated	196
Total	7389

stantial number of research and other administrators.

In this analysis of subject fields, every effort was made to record each individual's primary interest. For example, high school science teachers who indicated their *major* interest as teaching or science education were not classified as biologists or chemists, and, conversely, science teachers who stressed disciplines were tallied accordingly. If the data on disciplines are grouped under still broader headings than those in Table 3, the composition of the registered attendance is as follows: Physical sciences and applications, 1795 (24 percent); biological sciences, 1962 (27 percent); medical sciences, 1588 (21 percent); psychology and social and economic sciences, 878 (12 percent); science teaching and education, 404 (6 percent); general interest and other, 762 (10 percent).

The percentages for these groups have remained much the same in recent years. Over the past 12 years (except in 1957 in Indianapolis and in 1952 in St. Louis, when the physical sciences were first by a slight margin), the biological sciences have been the largest single group represented at each meeting, with, however, the physical and the medical sciences (in that order) following closely. Usually, both the social sciences and science teaching and education have ranged from 5 to 9 or 10 percent each year. This year, however, the strong program of the Section on Agriculture on land use and city planning and strong sessions in economics, sociology, and statistics, the symposium of the Section on Social and Economic Sciences, and the program of the Committee on Science in the Promotion of Human Welfare apparently combined to raise registration in this subject area to 12 percent of the total registration.

Table 4. Distribution of registrants by states and countries.

Alabama	13	Texas	34
Arizona	10	Utah	7
Arkansas	8	Vermont	18
California	147	Virginia	169
Colorado	21	Washington	17
Connecticut	291	West Virginia	19
Delaware	33	Wisconsin	63
District of Columbia	260	Wyoming	20
Florida	48		
Georgia	26	Total U.S.	7261
Hawaii	3		
Illinois	195	Argentina	1
Indiana	98	Australia	2
Iowa	28	Brazil	2
Kansas	27	Canada	85
Kentucky	19	Chile	2
Louisiana	48	Denmark	1
Maine	18	Eire	1
Maryland	315	Egypt	1
Massachusetts	376	England	6
Michigan	178	Finland	2
Minnesota	39	France	1
Mississippi	16	Germany	3
Missouri	50	Honduras	1
Montana	4	India	3
Nebraska	19	Israel	1
New Hampshire	31	Italy	2
New Jersey	791	Jamaica	1
New Mexico	11	Japan	2
New York	2896	Liberia	2
North Carolina	64	Nepal	1
North Dakota	5	Netherlands	2
Ohio	164	New Zealand	1
Oklahoma	9	Scotland	1
Oregon	10	Switzerland	1
Pennsylvania	503	Thailand	2
Puerto Rico	10	Venezuela	1
Rhode Island	68		
South Carolina	12	Total foreign	128
South Dakota	12		
Tennessee	38	Total registration	7389

Annual Exposition of Science and Industry

The 1960 Annual Exposition of Science and Industry was one of the most varied and attractive ever held. In addition to the "core exhibits" of publishers, supply houses, instrument companies, and laboratory-equipment firms, there were a number of special and large-scale industrial exhibits—some especially built for this AAAS meeting—which were of decided interest to the thousands who saw them. The 120 booths filled the Ballroom and the adjacent Fountain, West, and Key Rooms of the Biltmore Hotel and overflowed into two additional rooms, which the hotel enlarged and remodeled from rooms never before made available to the public. The AAAS Science Theatre, filled to capacity throughout, was located at one "elbow" of the exhibit area. Necessarily, the Visible Directory of Registrants was placed in two corridors within the exhibit area. Signs were placed at the entrance to every session room in the five hotels, reminding participants to see the exhibits during the four and a half days they were open.

The local Committee on Exhibits, headed by W. O. Baker (vice president-research, Bell Telephone Laboratories), enlisted the interest and support of large firms in the New York area. The exhibits of the International Business Machines Corporation and the American Telephone and Telegraph Company, the latter showing future transcontinental and intercontinental telephone service facilitated by artificial satellites, were striking. Grateful acknowledgment of the work of the Exhibits Committee is made on behalf of the Association and of all those who enjoyed the exposition.

The names of nearly all of the 99 exhibitors and descriptions of their exhibits appeared both in the General Program and in the preconvention issue of *Science* [**132**, 1634 (2 Dec. 1960)]. Additional exhibitors, accommodated after the preconvention issue had gone to press, were as follows: Affiliated Publishers, Inc.; Applied Science Laboratories, Inc.; A. C. Gilbert Company; Great Books of the Western World; Hg" Incorporated; International Business Machines Corporation; Professional Tape Company, Inc.; Royer and Roger, Inc.; and Servonuclear Corporation.

AAAS Science Theatre

At each meeting since the Chicago meeting of 1947, the AAAS Science Theatre has shown a selection of the latest foreign and domestic scientific films. It is now an established feature of the annual meeting of the Association. At the eighth New York meeting, 16-millimeter films were shown in seven 4-hour programs and in an abbreviated eighth session. Most films were shown

twice, and many a third time. The cooperation of the lending agencies is appreciated. Inevitably, there were a few changes from the scheduled program. Three films did not arrive, and two had magnetic tapes and could not be used. For such emergencies we had on hand, and used, the following: "Survie du Coeur," produced by Société Nouvelle Pathé Cinema; "The Chick Embryo" and "Sand Dune," produced by Encyclopaedia Britannica Films; and "Sea Urchin" and "Sound Research with *Vulpes vulpes*," obtained through the American Scientific Film Association. All the films have now been returned to their sources; inquiries about them should be directed to the producers.

Work of the Local Committees

As has been said before, a scientific meeting as large and as complex as the annual meeting of the AAAS does not just happen. It cannot take place, nor can it succeed, without the cooperation and assistance of a great many agencies and persons. Of critical importance among these are the local committees and the general chairman and other chairmen who appoint them.

Thus, the Association and all who attended the eighth New York meeting are greatly indebted to Eger Vaughan Murphree (president, Esso Research and Engineering Company), who, as general chairman, made distinguished appointments of chairmen of the local committees, kept in close touch with all phases of the meeting, and graciously welcomed members and friends of the Association on the evening of 28 December. On behalf of the Association, a grateful acknowledgment of the indebtedness of all of us to Mr. Murphree is made here.

The strenuous work of the Committee on Physical Arrangements and the contribution of the Committee on Exhibits are acknowledged above. The other committees, in their respective fields, also contributed greatly to the meeting.

The Committee on Public Information, again headed by Marion Harper, Jr., (McCann-Erickson, Inc.), as in 1956, provided expert advice and assistance in publicizing the meeting locally. Richard H. Van Horne (Communications Counseling Incorporated), throughout the planning, and James A. Wicht, in the pressroom during the meeting, were immeasurably helpful.

Premeeting announcements in the press are not readily secured (probably because a meeting is not news until it happens), but in New York the local scientific societies and the local press did provide a reasonable amount of advance information. The coverage *during* the meeting—front-page features and inside stories on two or more pages each day—was exceptional, both in quantity and quality. The Association expresses its grateful appreciation. Additional details on this, and on the splendid national coverage during the meeting, both in the press and on radio and television, will be found in the report, "Public Information Service," by Sidney S. Negus on page 480 of this issue.

The Association acknowledges with deep appreciation the work of the Finance Committee, which, through its chairman, Frank A. Howard (Sloan-Kettering Institute for Cancer Research), most effectively raised funds to eliminate the deficit. The firms and individuals who have made contributions include the following:

Air Reduction Company, Inc.
Allied Chemical Corporation
Amerada Petroleum Corporation
American Cyanamid Company
American Electric Power Company, Inc.
American and Foreign Power Company Inc.
The American Tobacco Company
T. Roland Berner
Bristol-Myers Company
Cities Service Company
Colgate-Palmolive Company
Consolidated Edison Company of New York, Inc.
Consolidated Natural Gas Company
Eastman Kodak Company
The Equitable Life Assurance Society of the United States
Esso Research and Engineering Company
Ethyl Corporation
General Dynamics Corporation
General Electric Company
General Motors Corporation
General Telephone and Electronics Corporation
W. R. Grace and Company
William S. Gray
Hooker Chemical Corporation
Frank A. Howard
International Business Machines Corporation
International Telephone and Telegraph Corporation
Irving Trust Company
Johnson and Johnson
Lazard Frères & Cie.
Lever Brothers Company
Merck and Company, Inc.
Minerals and Chemicals Philipp Corporation
Morgan Guaranty Trust Company
National Lead Company
Olin Mathieson Chemical Corporation
Otis Elevator Company
Owens-Corning Fiberglas Corporation
S. B. Penick and Company
Pfizer Foundation, Inc.
David Rockefeller
Laurance S. Rockefeller
Rockefeller Foundation
Schering Foundation Inc.
Shell Oil Company
Sinclair Oil Corporation
Alfred P. Sloan, Jr.
Smith Kline and French Laboratories
Socony Mobil Oil Company, Inc.
Stauffer Chemical Company
Texaco Inc.
Union Carbide Corporation
U.S. Rubber Company

The Honorary Reception Committee included heads of public and private agencies concerned with science and education. Many were able to be present during the meeting or made a point of attending the AAAS presidential address and reception.

The Association is greatly indebted to the local Committee on Women's Events for its devoted and able services in welcoming wives and other visitors and in arranging a luncheon with a speaker—Edith Quimby (College of Physicians and Surgeons, Columbia). Mrs. Eunice Thomas Miner (New York Academy of Sciences), chairman, and the members of her committee devoted many hours to making the luncheon program the success that it was. Grateful appreciation for their help is herewith expressed.

Other Acknowledgments

In concluding this report of the 127th meeting, besides thanking all members of the local committees, I personally wish to thank the key executives of all five hotels which provided professional assistance and friendly help throughout —especially Charles Quain and Ralph S. Burkowsky, of the Commodore; Xavier Lividini and Joseph Choplinski, of the Biltmore; and their counterparts at the Roosevelt, Waldorf-Astoria, and

Belmont Plaza Hotels. Their courtesy and assistance were essential for the success of the meeting.

The secretaries and program chairmen of the sections and participating organizations cooperated ably, especially in providing copy and galley proof for the 300-page General Program, published by the Horn-Shafer Company of Baltimore. Finally, the debt to W. Gilbert Horn, Jr., of that firm for his able and sympathetic cooperation in seeing the program through the press is more than nominal.

Awards and Prize Winners

A list of the recipients of the awards announced at the Association's eighth New York meeting appeared in *Science* [**132**, 1938 (30 Dec. 1960)] and need not be repeated here.

Public Information Service

Sidney S. Negus

As usual, the 127th meeting of the AAAS in New York afforded the Association one of its means for trying to increase public understanding and appreciation of the importance and promise of the methods of science in human progress. The initial step in this effort was taken in midsummer by Eger V. Murphree, president of the Esso Research and Engineering Company and general chairman of the New York meeting, when he invited Marion Harper, Jr., president of McCann-Erickson, Inc., to be chairman of the committee on public information on a volunteer basis. Most fortunately for the Association, Harper accepted this invitation, as he had done once before for the 1956 New York meeting, and soon had working with him as members of his committee the following: Leonard H. Goldenson, president, American Broadcasting-Paramount Theatres, Inc.; Robert Kintner, president, National Broadcasting Company, Inc.; James A. Linen, president, *Time*, Inc.; Daniel D. Mich, editorial director, *Look* Magazine; Malcolm Muir, chairman of the board and editor-in-chief, *Newsweek* Magazine; Robert W. Sarnoff, chairman of the board, National Broadcasting Company, Inc.; Frank Stanton, president, Columbia Broadcasting System, Inc.; and William L. Wheeler, Jr., secretary, Medical Society of the State of New York. The responsibility of this committee was to help set the stage for the formidable task of informing the public throughout the world of the newsworthy reports to be made concerning the progress of science in all its branches at this great gathering of scientists from nearly 300 organizations in this country and abroad. Never, in our experience, has a public information committee worked toward this end more effectively.

The next step was taken at the Medical College of Virginia, Richmond, in late August when active preparations were begun for this meeting in which 18 AAAS sections and 100 other organizations participated. Various preliminary details had been cleared during the summer months. Then the usual premeeting procedures, which had been found more or less successful in the past, were followed [*Science* **127**, 409 (1958)].

Three hundred and sixty-two accredited representatives of the press, radio, and television registered in the press room at New York. Only 23 individuals were denied press privileges because of inadequate credentials. Fifty-four other reporters in the United States and fourteen abroad, who could not be present, presumably reported the meeting from nontechnical abstracts and from complete papers mailed to them upon request before and during the meeting. This press room registration was by far the largest ever in the history of the Association, 200 more than in Chicago last year and 280 more than in Washington in 1958. Only 11 science writers covered the Richmond meeting in 1938. The fact that a total of 430 newsmen representing mass-media communication of all types were assigned to cover this scientific meeting must mean that there is an upward swing of interest on the part of the public in reports having to do with scientific research and development.

The New York city newspapers published reports about the meeting every day. On several occasions, full pages were devoted to it. For this outstanding job of science reporting, thanks go especially to experts like Robert Dwyer, William L. Laurence, Robert K. Plumb, Harold M. Schmeck, Jr., Walter Sullivan, Robert C. Toth, and Earl Ubell.

International coverage by reporters for the wire services and science writers for newspapers and magazines, including those abroad, was unusually good as far as can be determined from clippings and letters sent to the Association by friends. A clean-cut analysis of this coverage cannot be made since the AAAS does not subscribe to a clipping service. Since the meeting, requests have been received from individuals in 42 countries for more information about specific papers on the program. This fact alone is indicative that news of the reports made at the meeting was published world-wide.

Weekly magazines which devote some or most of their space to science reporting covered the meeting well in most cases. *Newsweek*, for example, featured the meeting with three full pages, *Business Week* with five, *Chemical and Engineering News* with one, *The New Yorker*, with nearly a page, with innumerable others following suit. Feature stories in monthly magazines having to do with various papers presented at the convention are now beginning to appear. There were many representatives of magazines registered in the press room principally for the purpose of picking up ideas for future articles. It is hoped, if and when these are published in the weeks and months to follow, that a credit reference will be given to the Association.

National and local radio and television coverage exceeded all expectations for these reasons: Early in the planning stages, Marion Harper, Jr., chairman of the committee on public information, asked Richard W. Van Horne of McCann-Erickson's public relations division, Communications Counselors, to be our associate in charge of radio and television programs for the meeting. Van Horne soon brought in from his organization as his assistant, James A. Wicht. Working in close cooperation with the press room, these communication experts set up 11 radio network programs, 14 television network ones, 23 radio regional broadcasts, 3 regional television programs, 22 radio-delayed broadcasts, and 2 newsreel programs. Radio-delayed programs refer to those which were taped for future broadcast. The Voice of America taped seven, the U.S. Information Agency six, and the educational station WBAI-FM (New York, Los Angeles, and San Francisco) taped nine radio-delayed programs. This total of 75 radio, television, and newsreel programs is by far the best coverage by these particular communications media ever experienced by the Association at any of its annual meetings. In our report of last year these words appeared: "In our opinion, broadcasting companies nationally are not as alert to the news in a great gathering of scientists as are the leading world newspapers and magazines, which employ expert science writers on their staff" [*Science* **131**, 518 (1959)]. Results in this area of communication at the New York AAAS meeting indicate either we were wrong in this opinion or that radio and television networks and regional stations are becoming increasingly aware of the fact that their listeners and viewers are demanding more programs having to do with science. We suspect that the latter is the answer. Other answers might be the caliber of Harper's committee, the know-how of Van Horne and Wicht, and the splendid cooperation of the 65 scientists who participated in the programs arranged.

Seventeen press conferences were set up during the meeting. The conference having to do with papers on one of the general session programs, "The Sciences in Communist China," was exceptionally successful and, with full texts supplied, resulted in extensive world-wide coverage. For these conferences and other activities in the press room, space was woefully inadequate but it was the best that could be obtained at the Commodore when so many larger rooms were required for AAAS sessions.

To Chauncey D. Leake, AAAS president at the time of the meeting, Paul E. Klopsteg, immediate past president, Thomas Park, AAAS president as of 15 January 1961, Dael Wolfle, AAAS executive officer, Raymond L. Taylor, AAAS associate administrative secretary and in charge of arrangements for the New York meeting, and members of the AAAS Board of Directors go the thanks of this department for their helpfulness on many occasions and for giving it a free hand to function as it deems best for the Association.

The Association is grateful to the friends of its public information service for helping to make enjoyable the extremely intensive task of reporting a meeting of this magnitude to the general public. Among these friends are the American Tobacco Company Research Laboratory which contributed daily coffee breaks for reporters working in the press room, the Florida Citrus Commission which supplied fresh orange juice each day for the hard-working press, the General Electric Company Research Laboratory for its suite, long a rendezvous for science writers at AAAS gatherings, where relaxation was in order for three evenings of the meeting, and the Westinghouse Electric Corporation for its Science Writing Awards reception and dinner.

For the ninth consecutive annual meeting of the Association, Thelma C. Heatwole, patent liaison officer for Philip Morris, Inc., was associate director of the press room. Her long experience as an intermediary between scientists and the press helped greatly in our supplying source material quickly for the reporters covering the meeting. In addition, besides Van Horne and Wicht, the following individuals carried out press room assignments efficiently and effectively: Foley F. Smith of Richmond, Va.; Patricia Paddock of the AAAS office in Washington; Sue Diamond of Communications Affiliates, Inc.; and John Jacoby of Flushing, N.Y. We also appreciate the cooperation of Ralph S. Burkowsky, assistant sales manager for the Commodore, and his associates, for taking care of our many requests so promptly and courteously. It is of interest that the press room prize for asking us the least number of questions was awarded to Harry A. Nelson. His reporting of the meeting for the Los Angeles *Times* was outstanding. Previous winners have been Victor Cohn of the Minneapolis *Tribune* and Robert Dwyer of the New York *Daily News*. The science writer who traveled the farthest to cover the meeting was Lucien Barrier of Paris, France.

The awareness on the part of science writers and reporters in general of the news available in all branches of science at a AAAS annual meeting was certainly evident in New York. The Association compliments representatives of the press, radio, and television on this alertness and is deeply appreciative that they assumed the tremendous responsibility of sharing this news accurately with the public world-wide.

Reports of Sections and Societies

Mathematics (Section A)

Two vice-presidential addresses were presented at the first session which was sponsored by Section A, on Monday afternoon. The first, by G. A. Hedlund (Yale University), was entitled, "Mappings on sequence spaces." Hedlund surveyed work on infinite sequences with elements 0 or 1 and reported his own research in this field, some of it involving the use of a digital computer.

William L. Duren, Jr. (University of Virginia), retiring chairman of Section A, spoke on the "Training of college teachers of mathematics and science." After stating figures for the probable number of available college mathematics teachers and observing that the present summer programs sponsored by the National Science Foundation are permitting high school mathematics teachers in many cases to become junior college teachers, he explored possible means of increasing the number of college teachers of mathematics. Listing a set of requirements for a college teaching degree he proposed means of meeting these requirements and suggested instituting a new type of degree.

Duren presided on Tuesday morning at a symposium on "The Mathematics Coursé on Continental Classroom," arranged by G. Baley Price. J. L. Kelley (University of California, Berkeley), whose television appearances the first semester this year were reported to be seen by an audience estimated as in excess of half a million persons, spoke on his experience in producing these lectures under the title, "Modern algebra." Frederick Mosteller (Harvard University) spoke of the second semester course, already largely recorded for second semester telecast, under the title, "Probability and statistics." The third speaker was Julius H. Hlavaty of the DeWitt Clinton High School, who spoke of the Tuesday morning television discussion for teachers of the algebra program, under the title, "The teacher-education program." The final speaker was Marvin Einhorn, who spoke on "Problems of the producer," and showed brief excerpts from the film recordings.

Since about 200 colleges give credit for the current course and 314 have already enrolled for the second semester, the symposium might well have attracted a larger audience than it did. Film recordings of the course will be available from the Learning Resources Institute (680 Fifth Avenue, New York).

The third program sponsored by Section A took place on Wednesday morning and was jointly sponsored by the Society for Industrial and Applied Mathematics. The program, entitled "Mathematics Approaches New Problems," was arranged by Brockway McMillan (Bell Telephone Laboratories). James Griesmer (International Business Machines) presided and opened the symposium by briefly commenting on the importance of the application of mathematics to areas in the physical and social sciences. Dean Gillette (Bell Telephone Laboratories) spoke on the application of game theory to military strategy and tactics. He showed how the theory of games prescribes a method of play which guarantees a known return no matter what the opponent does, a conservatism which is consistent with sound military planning. He cautioned, however, that a complex game-theoretic analysis based on a large number of assumed values may yield quantitative answers which may have no obvious relationship to the assumptions and which may be quite sensitive to assumed values. He added that game theory can contribute greatly to military strategy through the analysis of simple problems that indicate principles and tendencies consistent with the conservative approach. Frank Harary (University of Michigan) presented a paper on an application of graph theory to group dynamics. He used concepts from the theory of graphs to define a measure which describes the cohesiveness of a group. He assumed that the cohesiveness of a group is related to the amount of connectedness of its group structure, and developed three different types of connectedness to make an initial subdivision among group structures. He then further distinguished between group structures within each connectedness type through the notion of the "centrality" of a group. John Bertram (I.B.M.) spoke on the role of mathematics in control systems development. He discussed the evolution of the mathematical formulation of the control problem from Maxwell's time to the present day. He stated that, even though theoretical analysis alone is not adequate to deal with a complicated engineering system, experience has shown that the mathematical formulation of a simplified, but related, problem is often very useful. The mathematical solution and understanding of this related problem can indicate the direction of adjustment which will best improve the performance of the actual system.

WALLACE GIVENS, *Secretary*

Physics (Section B)

The outstanding event for physicists was the interdisciplinary symposium, "Plasma—The Fourth State of Matter," held on Wednesday, 28 December. The timeliness of this topic was attested by the overflow audience and the fact that the audience did not dwindle appreciably during the three-hour symposium. There were last-minute changes in the program, since two of the speakers, Fred T. Haddock (University of Michigan) and Thomas Gold (Cornell), became ill and had to cancel their presentations, the first early in December and the second on 23 December. Thanks, however, to the emergency action taken by Lyman Spitzer of Princeton, who had assisted in arranging the program and was to preside, a substitute was found—James A. Van Allen (State University of Iowa), who gave the second paper of the symposium, on the role of adiabatic invariants in geomagnetic trapping. He spoke of the mechanisms of trapping charged particles by the earth's magnetic field, resulting in the simplest of all plasmas.

The first paper, by Melvin B. Gottlieb (Princeton), was a clear exposition of the nature of the plasma and its many strange properties. This paper was of

considerable tutorial value to the audience, which included physicists, astronomers, science writers, and other interested persons. In the third paper, on instabilities in laboratory plasmas, Stirling A. Colgate (Lawrence Radiation Laboratory, University of California) explained how these present-day demons —instabilities in the plasma stream— are thwarting man's efforts to produce a thermonuclear reaction in the laboratory. Acknowledgment is made of the co-sponsorship of this program by Section D (Astronomy), the American Astronomical Society, the Division of Plasma Physics of the American Physical Society, and Sigma Pi Sigma.

The panel discussion on the place of nuclear engineering in the university curriculum was primarily arranged by Section M (Engineering) but was cosponsored by Section B, whose representatives participated in its planning and execution. There was a vigorous discussion for the full three hours, carried on by four panel members with differing ideas, and by the moderator, and thoroughly enjoyed by a rather small but keenly interested audience.

Unfortunately it seemed advisable to cancel the Physicists' Luncheon. On the basis of the very scant early sales of tickets it was impossible to make a reasonable guarantee to the hotel. Apparently the high price of meals in private dining rooms in New York hotels simply cannot be accepted by many of our colleagues; a solution must surely be found to this unhappy problem.

STANLEY S. BALLARD, *Secretary*

Chemistry (Section C)

The sessions of the chemistry section of the 127th meeting of the AAAS are now a matter of record, but those who had the good fortune to attend will long remember them as the occasion for the presentation of new concepts, of new and interesting scientific data, and of new or modified ideas for expanded research and scientific discipline.

Topics covered at the session on submitted papers were as follows: high-temperature adsorption studies on silica-alumina and molybdena-alumina catalysts by the use of flow techniques (P. E. Eberly, Jr., and C. N. Kimberlin, Jr.); low-temperature ionic scission of carbon-carbon bonds (Alan Schriesheim); Radiation-promoted hydrocarbon reactions (Peter J. Lucchesi); direct quantitative determination of radioactivity on paper chromatograms (Sayed H. Hilal and Walter E. Kisieleski); a gravimetric method for measuring deuterium-hydrogen exchange between water and natural polymeric solids (John L. Morrison); a study of carcinolysis (Paul Fluss, Robert Willheim, Mitzi Auber, and Benedict B. O'Malley); and heterogeneous enzyme activities of certain chymotrypsin preparations (Anwar A. Hakim).

A symposium on mechanism of action of antitumor agents, arranged by Charles C. Price, covered the following topics: 6-mercaptopurine (M. Earl Balis); azaserine (John M. Buchanan); folic acid antagonists (Charles A. Nichol); fluorinated pyrimidines (Charles Heidelberger); alkylating agents (Charles C. Price and Robert J. Rutman); and cyclophosphamide (Orrie M. Friedman).

The symposium on recent advances in polymer chemistry, arranged by Charles G. Overberger and Robert Ullman, included papers on the following topics: Diels-Alder polymers (J. M. Whelan); kinetic investigation of the solution polymerization of propylene (Donald F. Hoeg); aromatic polyethers (Charles C. Price); polyaromatics (James E. Mulvaney, Herward Vogel, Takayuki Otsu, Clause J. Abshire, M. Hasegawa, and C. S. Marvel); high-resolution nuclear magnetic resonance spectroscopy of polymers (F. A. Bovey); the stretching of crystalline polymers (R. S. Stein); studies of the secondary structures of ribonucleic acid (J. Fresco); and polymerization in the crystalline state (Herbert Morawetz).

Another symposium, arranged by George T. Kerr, dealt with synthetic zeolites, under the following topics: electrical conductivity of synthetic zeolites (Dennis N. Stamires); crystal structure of Ca-H_2O-chabazite (Joseph V. Smith); continuous and discontinuous changes in zeolite structure (Rustum Roy); and kinetics of crystal growth of zeolite A (George T. Kerr).

A symposium on reactions of complexes, arranged by John C. Bailar, Jr., included papers on the following subjects: substitution reactions of metal complexes (Fred Basolo); mechanism of racemization of complexes (Gordon Harris); catalytic racemization of complexes (W. Conrad Fernelius); and reactions of coordinated ligands (Daryle H. Busch).

There was only one discordant note in the entire program—projection difficulties which resulted in embarrassment for some of the speakers. Only slides of the very best quality can be satisfactorily projected on a small screen with a relatively old lantern in a long room—conditions which are unavoidable at a meeting such as this because of the large number of concurrent sessions. All speakers should therefore provide themselves with the best possible slides. A speaker at meetings of this general type should observe the following rules in preparing his slides: (i) always use positives; (ii) never use radio mats; (iii) never place more copy on any slide than can be typed conveniently in a 3¼- by 4-inch area in case a standard projection slide is desired; and (iv) type copy for photographic reproduction on good bond paper with a new black ribbon and back the sheet with black carbon paper. If these four suggestions are followed, a speaker may be assured of relatively good projection of his slide material. In my opinion poor slides materially detract from what might otherwise be a very good presentation.

The retiring chairman of the Section C is Robert W. Schiessler (Socony Mobil Oil Company), whose efforts during the year are greatly appreciated by both the section and the AAAS. The chariman for 1961 is Essie White Cohn (University of Denver), who has a very good program organized for next year's Denver meeting of the AAAS. The secretary of the section, elected for the next four years, is Seymour L. Meisel, who served very effectively during the past year as program chairman of Section C. Papers for the Denver meeting should be submitted, on or before September 1961, to Dr. Meisel, Research Laboratories, Socony Mobil Oil Company, Paulsboro, New Jersey.

ED. F. DEGERING, *Retiring Secretary*

American Association of Clinical Chemists (C1)

The program of the American Association of Clinical Chemists consisted of two parts: (i) a symposium on the biochemical applications of gas chromatography and (ii) a series of 26 contributed papers on various subjects related to medicine and biochemistry. Donald A. M. Mackay presided over the symposium; E. C. Horning, E. O. A. Haahti, B. G. Creech, C. C. Sweeley, and W. D. Cooke spoke on the pragmatic and theoretical aspects of gas chromatography as applied to the analysis of solid and high-boiling organic compounds. Particular emphasis was given to the determination of steroids,

drugs, and various urinary metabolites which have current significance in biochemistry. The session was very well attended. It concluded with a panel discussion, in which various questions from the floor were considered.

The contributed papers were quite varied in content. They dealt with such subjects as the enzymic determination of glucose, methods for determining several enzymes of clinical interest, lipoproteins, calcification, cancer, pernicious anemia, and neurologic disorders.

HARRY GOLDENBERG,
Program Chairman

Astronomy (Section D)

Section D cosponsored with Section B (Physics) the interdisciplinary symposium, "Plasma—The Fourth State of Matter." Section D also served as cosponsor of the American Geophysical Union's symposium, "Impact of Space Research on the Sciences," the National Science Teachers Association's session, "The New Astronomy," and Section E's symposium on selenology.

Section D also was a joint sponsor of the entire program of the American Astronomical Society. This included the Section D vice-presidential address by Ira S. Bowen on problems in future telescope design. It also included the Warner lecture by Halton C. Arp on the stellar content of galaxies and 73 contributed papers on various astronomical topics. A reception and the society dinner, held at the American Museum of Natural History, were followed by an exhibition of films designed to stimulate popular interest in astronomy.

The quality of the papers was high, and attendance at the sessions was large. Also of interest to the members was the lecture by Edward Anders, winner of the Newcomb Cleveland prize in 1959. This was entitled "Recent Work on Meteorites," and was part of the AAAS general symposium, "Moving Frontiers of Science."

F. B. WOOD, *Secretary*

Geology and Geography (Section E)

Ten symposia were held, and there were two sessions for contributed papers. Eighty-nine papers were presented; attendance at several sessions reached 250. A. John Haworth was program chairman and personally organized the geology program. The geography program was organized by Charles C. Morrison, Jr.

The symposium on "The Urban Frontier: the Conquest of Inner Space," a discussion of urban renewal, was presented as one of the AAAS general sessions.

At the Section E smoker Howard A. Meyerhoff, retiring section chairman, gave an address entitled "Mineral raw materials in the national economy," a historical account of mineral development in the Western Hemisphere and an assessment of the present position of the United States with respect to minerals.

At the Geographers' Dinner, George B. Cressey gave an illustrated lecture on his travels last fall in Saudi Arabia, Iraq, and the Mongolian People's Republic.

The geology program included symposia on palynology, frontiers in the earth sciences, the Mohole, and selenology. The Mohole symposium was an experiment; having been originally presented at the meeting of the American Association of Petroleum Geologists in Atlantic City last April, it was repeated for the AAAS audience because of the number of scientific disciplines concerned with the project. The experiment appears to have been a success; this was the best-attended symposium of Section E.

The geography symposia included further consideration of the theme of urban planning, with a discussion of the New York metropolitan region of the future. A symposium on Soviet geography considered training and current research interests in the U.S.S.R. The session on late Pleistocene events in southern South America considered glaciation, sedimentation, postglacial environmental changes, and—to emphasize the dynamic nature of the area—a description of the Chilean earthquake of 1960. In economic geography there were sessions on programming the use of natural resources and particularly timely sessions on economic development and investment in Africa south of the Sahara.

FRANK C. WHITMORE, JR., *Secretary*

National Speleological Society (E5)

The biology section of the meeting of the National Speleological Society was devoted to a symposium dealing with the physiological adaptations of cavernicolous organisms. Thomas L. Poulson outlined the varying metabolic rates of the Amblyopsidae, indicating the lower metabolic levels of the better-adapted cavernicolous forms as opposed to the higher levels in the epigean species of the same family. John W. Twente reported the principal adaptations of bats, such as heterothermy and preference for nocturnal activity, and reported that echolocation evolved as a secondary adaptation after caves had been invaded by bats for purposes of protection. Charles Mohr presented observations on a colony of *Eurycea longicauda* that indicate a homing inclination in the cave salamander. A paper by Orlando Park and Thomas C. Barr dealt with the concept of the cave ecosystem as an integrated community. Cave communities have not been well explored in this country, but preliminary studies indicate that the food chain is more complex than was formerly realized. Investigations in the Mammoth Cave area of Kentucky should produce more definite information within the next few years.

G. NICHOLAS, F.S.C.,
Program Arranger

Cave Mineralogy

A symposium on cave mineralogy was cosponsored by the National Speleological Society, the Geological Society of America, and Section E.

Cave minerals provide a unique opportunity for the study of crystal growth. In caves, conditions of temperature and partial pressure of water vapor and carbon dioxide remain nearly constant for many years. Cave mineralogists have recently focused their attention on the physics and chemistry of crystal deposition in the cave environment.

Three papers were concerned with the problem of crystal growth of the two most common cave minerals, calcite and aragonite. R. L. Curl emphasized the role of kinetic processes in explaining the metastable deposition of aragonite and suggested that foreign ions and temperature affect precipitation by changing the distribution of screw dislocations in the lattice and by changing the rate of nucleation rather than by contributing to lattice stability. G. W. Moore discussed the growth of stalactites and the role of soil carbon dioxide and ground-water *p*H. He noted that the observed preferred crystal orientation can be explained by the more rapid rate of growth of calcite in the *c*-axis direction. W. A. Bassett and A. M. Bassett reported on an observation

of a stalactite with the external form of a hexagonal crystal. They explain this occurrence by the rate of deposition of calcium carbonate and by the preferred rate of crystal growth along the *c*-axis.

In the final paper, W. B. White and G. H. Deike applied geochemical criteria to explain the magnesian calcites and other unusual mineral assemblages in Wind Cave, South Dakota.

The proceedings of the symposium, including all papers and the complete discussion, will be published as an issue of the *Bulletin of the National Speleological Society*, late in 1961.

WILLIAM B. WHITE, *Program Arranger*

Zoological Sciences (Section F)

The program of Section F represented nearly all major areas of zoology and comprised nine symposia and 19 sessions of research reports, with a total of 220 papers. R. L. Watterson served as program coordinator. Abstracts of the papers have been published by the American Society of Zoologists in *Anatomical Record* [**138** (Nov. 1960)].

Interdisciplinary discussions were again emphasized in the meetings this year; two symposia gave special attention to this approach. One, entitled "Submicroscopic Cellular Structure and Function" (arranged by Barry Commoner and Viktor Hamburger), continued the series "Unsolved Problems of Biology," on which Section F and Section G (Botany) have collaborated for the past several years. The other brought together discussions on the general theme, "Life under Extreme Conditions," with individual sessions devoted to cells and tissues (arranged by A. C. Taylor), plants and animals (arranged by C. P. Lyman), and human studies (aranged by J. P. Marbarger).

Two symposia considered problems of evolution: "The Evolution of Sex" (arranged by E. Witschi) and "Evolution and Dynamics of Vertebrate Feeding Mechanisms" (arranged by P. W. Gilbert and B. Schaeffer). Each of two half-day sessions was devoted to symposium discussions of modern aspects of population biology (arranged by R. C. Rollins), physiology of molluscs (arranged by R. A. Boolootian), and teaching animal behavior (arranged by E. B. Hale).

C. L. Hubbs and G. W. Wharton organized a delightful program in which anecdotes and recollections about famous zoologists were given. We hope that similar programs may be presented at future meetings. Another program new to Section F was a panel discussion on research opportunities for undergraduates.

The local committee, under the chairmanship of H. A. Charipper, performed splendid service in providing and operating equipment for the many simultaneous scientific sessions and in making arrangements for the Zoologists Banquet. The banquet was, again this year, a very pleasant gathering, with Emil Witschi a jovial master of ceremonies. Viktor Hamburger, the section chairman, gave a very interesting account of biological research in Japan in his address, "An embryologist visits Japan."

KARL M. WILBUR, *Secretary*

The symposium on molluscan physiology, in which each participant presented a brief paper and a summary of his recent findings, was well attended and well received. The varied discussions on such subjects as physiological ecology, functional morphology, digestive and reproductive physiology, nitrogen metabolism, and neurohormones proved to be interesting, stimulating, and provocative.

The proceedings of the symposium showed unequivocally that investigations on molluscs have contributed significantly to our understanding of basic biological phenomena and that future studies of molluscs should help us understand many basic patterns of biological activity.

R. A. BOOLOOTIAN,
Symposium Chairman

Spermatozoan Motility

Understanding of complex biological processes may be advanced by timely integration of ultrastructural, biochemical, and physiological information and principles. This was the viewpoint, in a measure supported, of a group of active investigators from British, French, and American laboratories who met to discuss the problem of spermatozoan motility at the New York meetings. Recent advances in the field were reviewed, and many new data were reported.

The four-session symposium was eloquently keynoted by Lord Rothschild (Cambridge) in an address of broad scope, entitled "Sperm movement, problems and observations." His address was followed by a provocative contribution by F. D. Carlson (Johns Hopkins), "A theory of the survival value of motility." H. B. Steinbach (University of Chicago), who presided at this session, discussed inorganic ion distribution in invertebrate sperm, and R. Rikmenspoel (Johnson Research Foundation, University of Pennsylvania) added significant comments concerning sperm velocity and wave characteristics.

The second session, generally devoted to structure in relation to function, included a paper by D. W. Fawcett (Harvard) on ultrastructure, illustrated by elegant electron micrographs; a biophysical approach by F. G. E. Pautard (Leeds University), in which he showed a film strip of an oscillating sperm-extract gel; and an excellent review by L. Nelson (Emory University), of cytochemical procedures applied to thin tissue sections and viewed in the electron microscope for the localization of enzyme complexes associated with oxidation and motility.

Biochemical processes were considered in the third session, presided over by R. J. Flipse (Pennsylvania State University). Current aspects of glycolysis, mainly investigated by isotopic techniques, were discussed by C. Terner (Boston University). P. H. Gonse (Centre de Recherches de Lyon) summarized his very impressive quantitative studies of the cytochrome components of bull sperm and the role of oxidative phosphorylation in motility. G. W. Salisbury (University of Illinois) reviewed the extensive work, principally from the Illinois group, of ionic and osmotic relationships of sperm in regard to motility.

The final session, presided over by T. Hayashi (Columbia), was primarily directed toward the mechanism of motility per se. J. Tibbs (St. Andrews) reviewed the status of sperm adenosine triphosphatase and included his recent findings on adenosine triphosphatase and acetylcholinesterase from fish sperm. The characteristics and significance of extracted flagellar models were discussed by D. W. Bishop (Carnegie Institution). The last paper, that of C. J. Brokaw (University of Minnesota), considered studies on algal flagella and constituted a memorable survey of motility processes and principles related to those of spermatozoa.

While some problems were seemingly settled by these discussions, freely entered into by an alert audience, perhaps more were raised. Certainly no final explanation of the mechanism of sperm motility emerged from these meetings, but many points were clarified, the main issues were defined, and certain feasible

routes of future investigation were suggested.

This symposium was cosponsored by the AAAS and the American Society of Zoologists supported by a grant from the National Institutes of Health. Publication of the complete proceedings is anticipated.

DAVID W. BISHOP, *Program Arranger*

Society of Systematic Zoology (F2)

The 12th annual meeting of the Society of Systematic Zoology included a session of contributed papers, a symposium on famous zoologists, a preview and discussion of the new International Code of Zoological Nomenclature, and other special events. Unfortunately, the society's collection of books on zoology was snow-bound in Illinois and was not available for the book lounge at this meeting.

One of the highlights of the meeting was the session on the lives of five famous American zoologists, arranged by Carl L. Hubbs and George W. Wharton and cosponsored by the American Society of Zoologists and AAAS Section F. The lives and personalities of Thomas Barbour, Leonhart Stejneger, Stephen A. Forbes, Joseph Grinnell, and A. S. Pearse were sketched by Alfred S. Romer, Waldo L. Schmitt, Harlow B. Mills, Alden H. Miller, and George W. Wharton, respectively. Carl L. Hubbs presided at the session. These sketches are to be combined with those from a previous program and published in book form.

Another high point was the lively discussion of various provisions of the new International Code of Zoological Nomenclature, under the leadership of W. I. Follett. Panelists for this discussion included Richard E. Blackwelder, Carl L. Hubbs, Ernst Mayr, and Curtis W. Sabrosky.

Another important event was a tour of the American Museum of Natural History, with visits to the various working departments of the museum by individual systematists, followed by a coffee hour. Arrangements for this pleasant visit were made by Horace W. Stunkard.

Retiring president W. I. Follett presided at the annual business meeting and received the reports of various officers. Recent actions and plans of the council were reviewed by secretary R. Tucker Abbott, and the elections committee announced the election of Curtis W. Sabrosky as president-elect for 1961. Fenner A. Chace, Jr., and R. R. Miller were elected councilors for the period 1961–64. Richard E. Blackwelder is president of the society for 1961.

CHARLES F. LYTLE, *Program Chairman*

Biomedical Information-Processing Organization (FG4)

The Biomedical Information-Processing Organization held its first meeting 30 December, 1960. The new organization considers itself extremely fortunate in having had three distinguished speakers discuss problems related to its aims and goals. Joseph S. Murtaugh (National Institutes of Health) spoke on "Some developments in medical research of meaning for the computer field," discussing many of the areas of significant advances in biomedical research and the related possible role of the computer. Harold K. Skramstad (National Bureau of Standards) spoke on "Analog-digital devices and problems involved in suggesting standards," describing the basic technology of analog and digital devices and the problems of suggesting standards in this area. Walter M. Carlson (American Institute of Chemical Engineers and E. I. du Pont de Nemours) spoke on "Problems involved in sharing digital computer codes and programs," reviewing the problems encountered and solutions proposed by the Machine Computation Committee, American Institute of Chemical Engineers, in sharing computer programs from a subject-oriented point of view.

Officers were elected and a constitution outline was accepted during the business meeting. The officers are as follows: inaugural president, Robert S. Ledley; president, Max A. Woodbury; president-elect, Norman F. Shapiro; secretary-treasurer, Charles J. Roach; council members, Lee D. Cady, Jr., and John F. Hearon.

ROBERT S. LEDLEY, *Program Arranger*

Nature Conservancy

At an open meeting of the National Committee for Natural Areas for Schools, the topic of outdoor research for indoor education was introduced by John Brainerd (Springfield College). A welcome was extended in the name of the AAAS and of nature conservancy, and the importance of outdoor experience with natural phenomena as a stimulus for interesting young people in science was emphasized. Kodachrome diagrams indicated that the design of school grounds has not kept pace with that of school buildings. Kodachromes of school sites demonstrated the modish but sterile uniformity of many school sites as compared with the grounds of schools that carefully preserve or create environmental diversity useful for programs of outdoor education correlated with indoor classes.

Stanley Cain (University of Michigan) discussed plant distribution on school grounds, bringing to the fore such basic problems as nomenclature, areal distribution, and causality. He indicated possibilities for planning environmental studies in connection with physical-science courses. He stressed the need for mathematics in sampling, and stated that an understanding of botany is needed for studies of plant density, frequency, coverage, and life form—studies which can be made on school grounds or in neighboring fields.

Leslie Clark (Society for Protection of New Hampshire Forests) led a discussion of woodland natural areas and school forest research and emphasized the tremendous number of possible research projects that require a minimum of equipment.

David Davis (Pennsylvania State University) provided information on trapping, marking, and humane methods of handling small animals. He indicated ecological questions which can challenge young scientists studying "animal populations on school grounds." Photography as a research technique and stimulus to scientific inquiry was presented by Charles Mohr (Philadelphia Academy of Natural Sciences).

Jacob Shapiro (Wisconsin State College) stressed the difficulties of training teachers in natural science and described this all-important work.

JOHN W. BRAINERD, *Program Arranger*

Society for the Study of Evolution (FG10)

The society held seven meetings, all in the Biltmore Hotel, with a total of 39 papers presented. On 27 December it held a symposium jointly with the American Society of Naturalists and others, on modern aspects of population biology. This was arranged by Reed C. Rollins of the American Society of Naturalists and Harlan Lewis of the Society for the Study of Evolution. It included sessions on phylogenetic aspects of evolution, genetic aspects of evolution, speciation and variation, and ecological aspects and methods.

At the general session of the society Alfred E. Emerson delivered the presidential address, "Vestigial characters of termites and the processes of regressive evolution." To everyone's regret, illness prevented H. J. Muller from presenting his invited paper at this session.

At the business meeting it was announced that D. Dwight Davis is managing editor of *Evolution* (a new office). Announcement was also made of the new officers and councilors for 1961: president, Harlan Lewis; president-elect, W. Frank Blair; vice presidents, M. J. D. White, John A. Moore, and E. C. Olson; treasurer, Robert E. Beer; council members, Verne Grant and Dean Amadon.

HERBERT H. ROSS, *Secretary*

Botanical Sciences (Section G)

The successful program of Section G was organized jointly with Section F (Zoological Sciences), the Torrey Botanical Club, and the American Society of Zoologists. A symposium on fundamental developments in plant growth, consisting of eight invited papers, was planned by the Torrey Botanical Club. A symposium, cosponsored with Section F, on life under extreme conditions, consisted of seven papers.

The 1960 "Unsolved Problems in Biology" program, organized by sections G and F and arranged by Barry Commoner in cooperation with the American Society of Zoologists, was titled "Submicroscopic Cellular Structure and Function." Another symposium, "Machine Methods in Biology," was organized for Section G by David Rogers of the New York Botanical Garden. A session of contributed papers completed the scientific offerings.

The usual dinner sponsored by the Botanical Society of America was replaced by a luncheon arranged by the Torrey Botanical Club. At this luncheon Commoner gave his address as retiring section chairman. Publication of the address ("In defense of biology") in expanded form will be an event of interest to all biologists.

HARRIET B. CREIGHTON, *Secretary*

Anthropology (Section H)

The program in anthropology lasted five days and included seven symposia ranging through nearly all aspects of the discipline.

The session on physical anthropology ranged in subject matter from chromosome numbers in primates, to the application of blood-group studies, to physical anthropology and the genetic aspects of certain social groupings. A closely coordinated session on archeology gave a world view of salvage projects and needs, including Egyptain, British, Canadian, and Chinese programs in addition to our own River Basin salvage program. Applied anthropology was represented by a session on the interdisciplinary approach to methods of implementing desegreation; another session on the development of new nations, specifically those in West Africa, Southeast Asia, and the West Indies; and still another on the development and future of applied anthropology. Social anthropology was further served by a symposium on theories and models of energy in human society and a session of contributed papers. A symposium on language and cognition was cosponsored by Section I (Psychology).

An eighth symposium, on ecology and anthropology, was arranged by Paul Baker for the Ecological Society of America and was cosponsored by Section H.

In welcoming remarks at the beginning of the annual meeting, Cornelius Osgood, section chairman, expressed a New Year's wish that there might be established in our federal government a department of cultural affairs in which trained specialists would concern themselves with the empirical evaluation of both foreign ideals and United States culture for the use of all who need unbiased information of this kind.

The unhurried atmosphere of the meeting and the ample periods of discussion and questioning are to the credit of these who arranged the excellent symposia and other sessions—especially Eleanor Leacock, who put together the entire program.

J. L. GIDDINGS, *Secretary*

Psychology (Section I)

The program of Section I included the vice-presidential address of Clifford T. Morgan on the nature of color reception in the human retina; four symposia arranged by the section ("The Physiology of Feeding and Drinking Behavior," "Some Recent Approaches to the Learning of Concepts," "Applications of Behavioral Technology," and "Theories of the Visual Contrast Threshold"); a series of five symposia arranged by the American Psychiatric Association and cosponsored by the section, on expression of the emotions in man; and two symposia cosponsored with Section H ("Interdisciplinary Approach to Methods of Implementing Desegregation" and "Language and Cognition"). Attendance was good, and audience participation was outstanding, especially for the first two symposia.

The section committee held its usual luncheon meeting. Basic plans were formulated for the Denver meetings, with an increased emphasis upon cross-disciplinary subjects (such as sleep and factors in food acceptance). Opportunity for voluntary participation in the symposia will be provided, to supplement the usual method of invitation. There was discussion of means for involving the affiliated organizations more effectively in the activities of the AAAS.

The vice president for 1961 is Carl Pfaffmann of Brown University, and the new member-at-large of the section committee is Lloyd G. Humphreys of the University of Illinois.

FRANK W. FINGER, *Secretary*

Social and Economic Sciences (Section K)

The American Economic Association effected a breakthrough in the activities of Section K by holding its first session at an AAAS meeting under its own initiative. Praise for an excellent program goes to Kenneth E. Boulding (University of Michigan), assisted by Samuel J. Mantel (Case Institute). The American Political Science Association, the American Sociological Association, and the American Statistical Association again cooperated in the general section program. All of these sessions were cosponsored by Section K, which also served as a joint sponsor of the AAAS general session on "The Urban Frontier."

A feature session of the section program was that on "Some Perspectives on Political Science and Science." This session, at which Pendleton Herring (Social Science Research Council) delivered the vice-presidential address, was jointly sponsored by the American Political Science Association, AAAS Section K, and the National Institute of Social and Behavioral Science. Carl B. Swisher (Johns Hopkins) presided on behalf of the American Political Science Association. Herring delivered a

thoughtful and incisive address on "science and the polity," and the session developed useful material on substantive problems in political science and on science problems in the area of public administration. The National Institute of Social and Behavioral Science also cosponsored the session of the National Science Teachers Association on the biology of the mind.

The section gratefully acknowledges the contribution of Vincent H. Whitney (University of Pennsylvania) in arranging the sessions of the American Sociological Association on the sociology of science and on population trends and policies in the Communist countries. The latter program was cosponsored by the Population Association of America. Similarly, it acknowledges the contribution of Monroe Lerner (Health Information Foundation) and of Abram J. Jaffe (Columbia) and Nathan Morrison (New York State Department of Employment) for arranging the two excellent sessions of the American Statistical Association.

Other society programs included a session of the Metric Association, with John T. Johnson presiding, and a session of Pi Gamma Mu and the National Academy of Economics and Political Science, with John Green (U.S. Department of Commerce) presiding. The Social Science Research Council served as a cosponsor of the AAAS general session on the Sciences in Communist China.

The general Section K program was concluded with two sessions for contributed papers, on 30 and 31 December. All fields of social and behavioral science were represented in the ten papers presented. Both sessions were well attended, and there was lively discussion on the part of the interested and knowledgeable audience. Donald P. Ray, section secretary, presided.

The officers of Section K and the section committee appreciate greatly the cooperation and effort of all those who contributed to the success of the New York programs. It is felt that the interest of both social and natural scientists in the undertakings of the section has become firmly established.

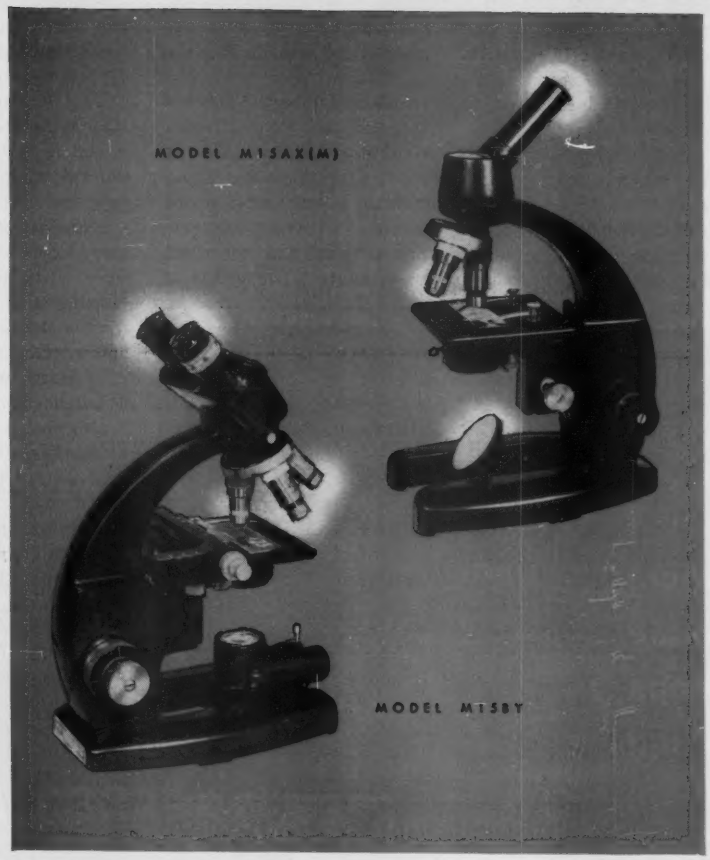
Section K was fortunate to have had the leadership during 1960 of Pendleton Herring, political and social scientist, as vice president and chairman. This year Frederick F. Stephan (Princeton), social statistician, is the elected chairman, and Marshall E. Dimock (New York University), political scientist, begins a 4-year term of service as member-at-large of the section committee. Dimock fills the vacancy created by the retirement of political scientist Luther H. Gulick (Institute of Public Administration), who has rendered gracious service in this position.

DONALD P. RAY, *Secretary*

American Society of Criminology (K3)

The six sessions of the American Society of Criminology's 20th annual meeting were well attended (200 to 300 participants) and spirited. Among the more important areas of discussion were the following. Society defeats the rehabilitative objectives of even the best prison programs by its open hostility to the ex-convict, but society itself is legitimately concerned about the low level of protection it receives from the attacks and other depredations of the offender group (Melitta Schmideberg). Judicial decisions, rulings, and sentences are conditioned not only by the politico-socioeconomic backgrounds of the judges but by their mental and physical health, age, perceptive capacity, prejudices, and personality quirks (Charles Winick, New York University). Female homosexuals can be cured by long-term psychoanalytic therapy, but the prognosis is very poor for the more masculine type (Richard C. Robertiello). The patients seen at the New Jersey Diagnostic Center are largely the minor sex offenders, often immature and inadequate, while more dangerous sex offenders, arrested and convicted of crimes usually not considered "sex crimes" (arson, assaults, and homicide) are frequently institutionalized (or released) without diagnosis (Eugene Revitch). Citizens' crime commissions can be ineffective and can even impede the proper administration of criminal justice if they are organized solely for political purposes, are improperly staffed, or are unrealistic and unsympathetic in their approach to the problems of police and prosecutors (Alvin J. T. Zumbrun). The influence of the communications media (radio, television, moving pictures, comic books, newspapers) on crime and delinquency patterns has been grossly exaggerated by Wertham *et al.* Not only is there no demonstrable cause-and-effect relationship between crime and the violence and sex presented in these media but a strong, logical case might be made for the proposition that, by identifying with the antisocial protagonist, even the disturbed and potentially dangerous individual might well satisfy his lusts vicariously and become less of a threat to society (D. E. J. MacNamara, New York Institute of Criminology). Only in an interdisciplinary center, organized along nonauthoritarian lines and truly collegial in its approach, can effective studies of delinquency and its associated phenomena be carried on (Kenneth Kindelsperger, Syracuse University). The apparently motiveless homicide, if intelligently and intensively analyzed, can be understood in terms of the developmental influences and stresses peculiar to the murderer (James M. Reinhardt, University of Nebraska).

Also, state programs in delinquency prevention and control should be largely coordinating and supportive (Milton Luger, New York State Youth Commission). Both social workers and police officers must make greater efforts to understand not only each others' problems but the differential backgrounds and training which lead at times to seemingly conflicting approaches to the same general objectives (Russell Hogrefe, Chicago Youth Centers). Leaders of antisocial (fighting) gangs should be identified early and isolated for psychiatric treatment; referring to them as "psychos" instead of "hoods" will lower their prestige and status among the large, amorphous gang membership (Lewis Yablonsky, University of Massachusetts). The gang-leadership project of the New York City Youth Board has proved, even though it has been inadequately financed and staffed, that the antisocial energies of even very violent youth gangs can be redirected toward more socially acceptable activities (Hugh Johnson, New York City Youth Board). Changing the vacation schedules of attendance officers, recreation leaders, and teachers specially trained in the handling of delinquents, and using all school facilities at maximum capacity during the summer period, resulted in drastic reductions in summer delinquency statistics (Arthur Clinton, New York City Board of Education). With rare exceptions, conditions in juvenile detention facilities throughout the United States are depressingly inadequate: staffs are poorly selected, poorly paid, poorly trained, and poorly supervised; overcrowding makes rehabilitative programs impossible; and inadequate classification and segregation make some institutions veritable "crime schools" (Sherwood Norman, National Council on Crime and Delinquency). Extremely high positive correlations have been established between drinking and the com-



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mission of the felony for which convicts were serving sentences in Raiford (Florida) State Prison (Shaw Grigsby, University of Florida).

Also, containment is posited as a new operational theory for criminology (Walter Reckless, Ohio State University). A scientific concept for criminal responsibility is perhaps the most crucial issue in contemporary criminology (Frank Hartung, Wayne State University). A complete reorganization and reorientation of the Liberian National Police becomes effective in 1961, reflecting the influence of an ICA survey and the increasing urbanization and westernization of the Liberian population (Stephan Horton, Liberian National Police). International exchange of information is as basic to advances in criminal law and criminology as it is to advances in other scientific fields (Horst Schroder, University of Tübingen). The International Penal and Penitentiary Commission contributed significantly to advances in penology during the past century, and its files and reports, now indexed, are a gold mine for penological researchers (Thorsten Sellin, University of Pennsylvania). August Vollmer introduced scientific experimentation and professional standards to American policing and is outstanding among 20th-century contributors to criminological and police science (John Kenney, University of Southern California). Study of some 600 murders during a 4-year period in Philadelphia has introduced new methodological techniques of value in criminological research and has called into question certain commonly held, though unvalidated, assumptions as to the previous arrest and conviction records of murderers (Marvin Wolfgang, University of Pennsylvania).

The 1959 annual award of the American Society of Criminology was presented to Thorsten Sellin, president of the International Society of Criminology, for distinguished contributions to the science of penology. August Vollmer awards for research in criminology were presented to Paul Bohannan, Northwestern University anthropologist, for his *African Homicide and Suicide*, and to Marvin E. Wolfgang (University of Pennsylvania) for his *Patterns in Criminal Homicide*.

Officers of the American Society of Criminology for 1961 are as follows: president, Donal E. J. MacNamara (dean, New York Institute of Criminology); vice-presidents, Karl Menninger (Topeka, Kansas), Sheldon Glueck (Harvard), Gordon Barker (University of Colorado), and Pedro M. Velez (director of special investigations, Commonwealth of Puerto Rico); executive board member, John Kenney (University of Southern California); secretary-treasurer, Jacob Chwast (chief consulting psychologist, Educational Alliance, New York). Marcel Frym, the outgoing president, was named principal program consultant for the 5th International Congress of Criminology, to be held in Los Angeles in 1962. Charles Newman (University of Louisville) was appointed coordinator of research and studies for the congress, and Clyde Vedder (Northern Illinois University) was appointed liaison officer, to work with the sociology departments of American universities.

JACOB CHWAST, *Secretary-Treasurer*

Sociology of Science

The session on "Sociology of Science: The Organization of Research" was cosponsored by Section K and the American Sociological Association. The session was organized by Vincent H. Whitney (University of Pennsylvania) and chaired by Simon Marcson (Princeton and Rutgers). Marcson also reported on the organization of an industrial research laboratory and the relation of authority to organization.

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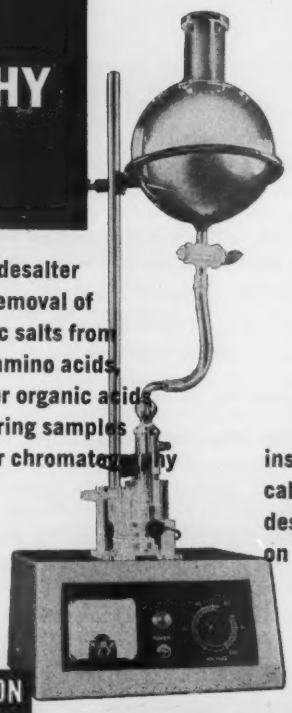

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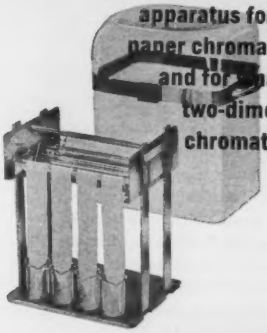

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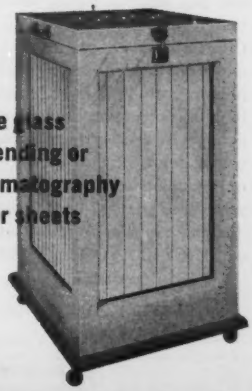

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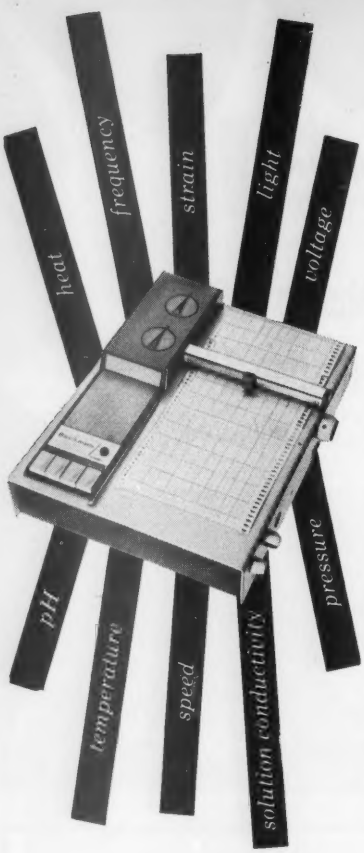

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oratories) continued the discussion of the industrial laboratory in terms of the pressures and role strains created by a specific organizational form. David N. Solomon and Silvia Lamb of McGill University reported on a study of industrial scientists (chemists) and their values vis-à-vis science. Norman Kaplan (Cornell) compared the role of the research administrator in the Soviet Union with that of his counterpart in the United States and pointed out differences which suggest the possibility of a simplification of administrative practices in large-scale research organizations in this country.

A vigorous discussion followed, with participation from the floor.

VINCENT H. WHITNEY,
Program Chairman

Population Trends and Policies

The session on population trends and policies in the Communist countries was cosponsored by Section K, the American Sociological Association, and the Population Association of America. The growth of population, changes in population structure and distribution, and the consequences of these developments were discussed for three major regions with Communist governments. Jerry W. Combs, Jr., (Foreign Manpower Research Office, U.S. Bureau of the Census) reported on Eastern Europe; John F. Kantner (Population Council) analyzed changes in the Soviet Union; and Irene Taeuber (Office of Population Research, Princeton) discussed mainland China in terms of three interrelated factors—political philosophy, culture, and population. Irene Taeuber also served as chairman of the session, which was organized by Vincent H. Whitney of the University of Pennsylvania.

VINCENT H. WHITNEY,
Program Chairman

American Statistical Association (K5)

The New York Area Chapter of the American Statistical Association and AAAS Section K jointly sponsored a program on hospital statistics in community planning, arranged by Monroe Lerner (Health Information Foundation, New York). Paul M. Densen, deputy commissioner of health, New York City, presided.

J. Douglas Colman (Associated Hospital Service of New York) described research opportunities in the use of data routinely collected for administrative purposes by health agencies. Careful analysis of such data could provide answers to questions about comparative rates of hospital utilization, trends in the type and amount of hospital services, the impact of repeated admissions on hospital use, and so on. Such data are available at relatively little additional effort or cost from records or from already existing tabulations.

Paul Sheatsley (National Opinion Research Center, University of Chicago) discussed some methodological problems in a survey of the pattern of hospital use in Massachusetts. Interviews were conducted with 2500 patients (a sample of all admissions in the state over a 12-month period), with the physicians and hospital administrators involved, and with a sample of the general population. The purpose was to reconstruct the exact chain of events—physiological, socioeconomic, and psychological—leading to the decisions to hospitalize the patient and, subsequently, to discharge him from the hospital.

Monroe Lerner (Health Information Foundation) discussed some preliminary results of a survey comparing hospital utilization under Blue Cross in Indiana during 1956 and under a government insurance program in Saskatchewan during 1957. This survey was offered as an example of the use of already existing data. Hospital use was higher in Saskatchewan than in Indiana; this was especially true for obstetrical and respiratory cases, but was true to some extent for cases of all kinds.

Marta Frankel (New York City Department of Hospitals) described patterns of hospital utilization by the aged in New York City's municipal hospitals. The data were derived from administrative reports of individual hospitals and from patients' medical charts. The aged account for 18 percent of all patients discharged from these hospitals and for 35 percent of the hospital population in a randomly selected day. Diseases of the circulatory system constituted the most important cause of hospitalization in these patients.

MONROE LERNER, *Program Arranger*

The AAAS and the New York Area Chapter of the American Statistical Association held a joint session on "Some Statistical Problems in Social Insurance Research." Mortimer Spiegelman (Metropolitan Life Insurance Company) was chairman. Harry Malisoff (Brooklyn College) spoke on "Some invarient characteristics of unemployment in-

surance beneficiary experience"; David Robbins (Health Insurance Association of America), on "Some statistical problems in medical insurance programs"; A. Berman (New York State Labor Department), on "Selected studies in the field of workmen's compensation"; and A. J. Jaffe (Columbia University), on "The family and social insurance programs."

A. J. JAFFE, *Program Arranger*

Metric Association (K6)

The Metric Association held a symposium on 27 December, with J. T. Johnson, president of the association, as moderator and with the following participants: Lewis L. Strauss (former Secretary of Commerce), Carl F. Kayan (Columbia), Robert P. Fischelis (National Drug Trade Conference), and Karl E. Ettinger (research counselor, New York). Fred J. Helgren, secretary of the association, was unable to be present.

Strauss emphasized the importance of immediate consideration of the question of adopting the metric system. The following quotation gives the gist of his remarks: "Most of us in this room probably share the conviction that eventual change to the metric system is inevitable, and if inevitable, then most of us would wish this to occur before we have suffered more severely in our relationship with metric system countries than today has been the case, this in spite of the fact that we are aware that the change will be expensive and, in instances, difficult. We are fortunate in having a very able and distinguished scientist as Director of the National Bureau of Standards, Dr. Allen Astin. Dr. Astin has assigned Dr. A. T. McPherson, his Associate Director, the responsibility of conducting studies on the problem of conversion. The Bureau expects to explore the progress realized in Japan and India and the problems encountered in transfer to the metric system by those great populations."

The luncheon was attended by 15 of the 30 members present for a business session. A group was organized to act as an interim committee of trustees to organize the Metric Association for new and wider activities, international in scope, during the next two months. Members of this committee are as follows: Robert P. Fischelis (Washington, D.C.), chairman; Carl F. Kayan (New York City); Frank Y. Speight (American Society for Testing Materials, Phil-

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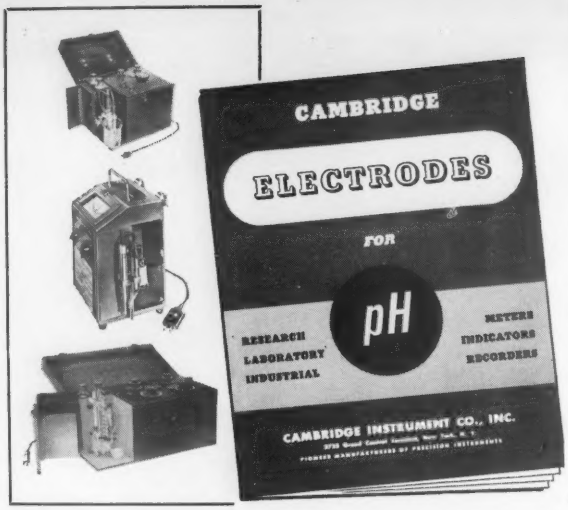

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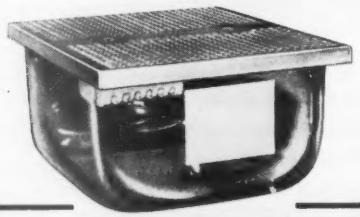

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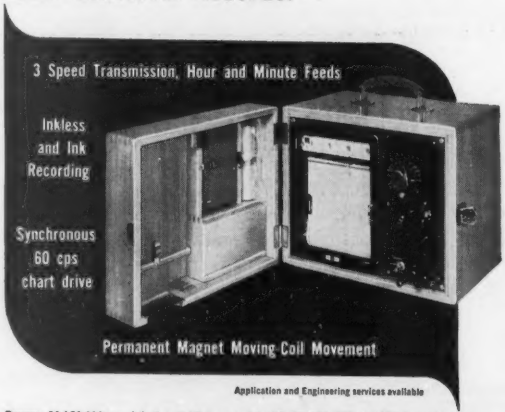
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adelphia); Floyd W. Hough (Committee for Study of Metric System under Auspices of American Geophysical Union); and Karl E. Ettinger.

J. T. JOHNSON, *President*

National Academy of Economics and Political Science (K7)

The National Academy of Economics and Political Science, with the collaboration of the national social science honor society Pi Gamma Mu, presented a program on "The Research Revolution and Public Policy." Leonard S. Silk, author of the recent book, *The Research Revolution*, presented a paper on "The research revolution and its economic implications," and Jacob Perlman of the National Science Foundation contributed one on "Public policy and the inter-sectoral flow of funds for research and development in the United States."

In his analysis of the growth of our economic system, Silk related the easing of the pains of technological change to further scientific and technological progress. After stating that "the present situation, in which international military and political conflict also involve a race for scientific and technological supremacy, has made the formulation of science policy one of the major public issues of our time," Perlman outlined the results of a program of surveys of expenditures and manpower involved "in basic and applied research and development throughout the economy"—surveys which he and his associates at the National Science Foundation made in order to provide the data essential to the formulation of science policy.

John C. Green, director of the Office of Technical Services of the U.S. Department of Commerce, presided and, through his practical experience and services of many years, contributed ably to the discussion. The two papers were exceptionally well received, and the academy plans to give them the widest possible distribution.

AMOS E. TAYLOR, *Chairman*

History of Science Society (L2)

The History of Science Society had a successful and well-attended meeting. The highest honor of the society, its Sarton medal, was presented to Owsei Temkin, professor of the history of medicine, Johns Hopkins. The Schuman prize, given for the best published book in the field, went to Mar-

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shall Clagett (University of Wisconsin) for his book *The Science of Mechanics in the Middle Ages* (University of Wisconsin Press, 1959), and the Pfizer prize was awarded to Harold L. Burstyn, a graduate student at Harvard, for his research on Galileo, which is to be published in a forthcoming number of *Isis*.

In his address as outgoing president, Henry Guerlac stated that professional emphasis on the history of science had increased enormously during his period of office. The society now has a central core of university teachers of the subject, as well as a band of distinguished amateurs. I. Bernard Cohen (Harvard) was elected president for the current term of office. A special feature of the meeting was the first George Sarton Memorial Lecture, delivered before the AAAS by Rene Dubos of Rockefeller Institute. It was a noteworthy beginning for a series that will undoubtedly prove to be one of the major attractions at future AAAS meetings.

Two of the sessions of contributed papers deserve special mention. One, on the sociology, psychology, and economics of science, with papers from Bernard Barber, Karl Deutsch, and Anne Roe, was something of an innovation and displayed how important these interdisciplinary areas are for the historian of science. It is hoped that the proceedings of this session may be published in their entirety. A second innovation for the society was a session comprised of 15-minute papers on work in progress. This was most successful and gave the members an opportunity to hear from a large number of their younger colleagues, and from several projects whose final results will not be available for some time.

Unfortunately Anne Roe and Martin Dyck were unable to attend because of illness. Dr. Roe's paper was read for her by Mr. Mendelsohn, of Harvard University.

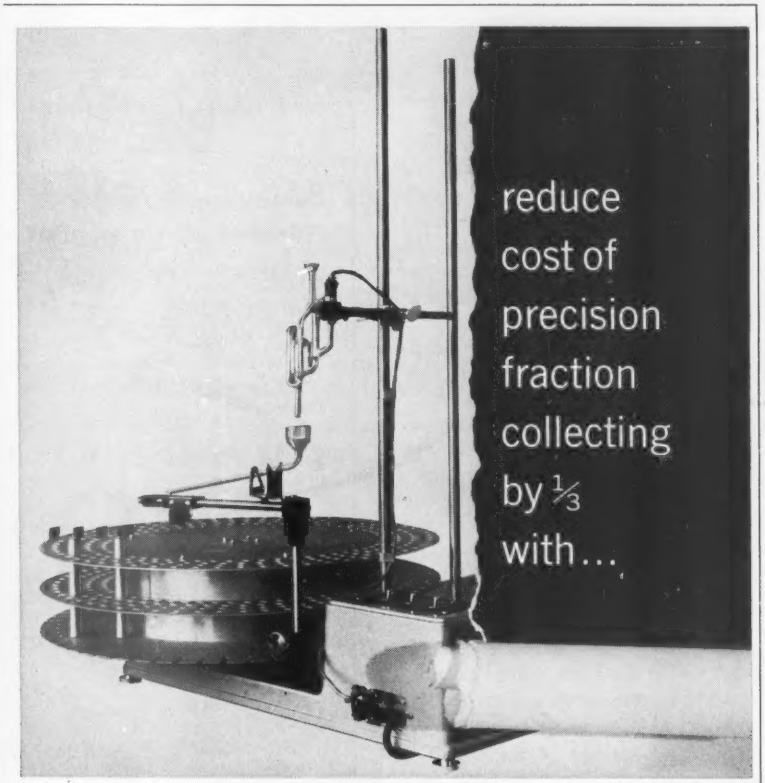
DEREK J. DE SOLLA PRICE,
Program Chairman

Society for the History of Technology (L5)

Emphasis upon technology as a causative factor in historical development and upon the sociological and scientific interrelations of technological change marked the third annual program of the Society for the History of Technology.

In a joint session with the American Historical Association on the topic "Technology as Cause in History," Roger Burlingame pointed out that technology is a "neglected clue to historical change," for historians have written of wars, economic theory, explorations, and the like, without expounding on the technological developments which lay at the foundation of the historical events. As counterpoint to Burlingame's thesis, Lewis Mumford claimed that history was a "neglected clue to technological change," for the historian of technology must open his eyes to the whole cultural milieu in order to understand technical change. Mervin J. Kelly, retired president of the Bell Telephone Laboratories, presided over this session, and H. Stuart Hughes (Harvard) commented on the papers of Burlingame and Mumford, indicating that the history of technology is not merely a specialized area of history of technology but is itself a way of understanding the past.

Papers on the development of automation, by John Diebold (industrial consultant, New York) and by James R. Bright (Harvard Graduate School



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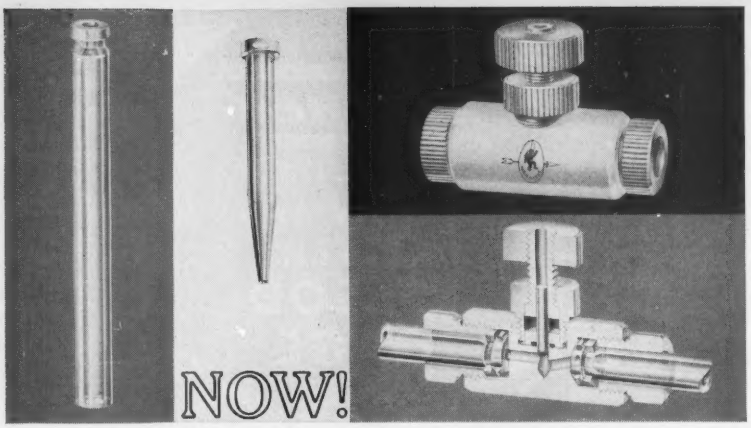

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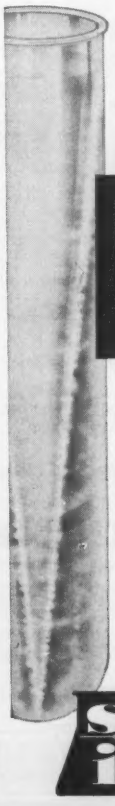

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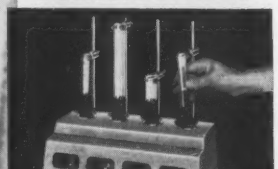

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of Business Administration), led to a spirited discussion on the impact of automation on society. A. J. Jaffe (Columbia) stimulated the discussion by his trenchant commentary on the prepared papers. Preston R. Bassett (former president of the Sperry Gyroscope Corporation) served as chairman of this session held jointly with AAAS sections L and M.

Another highlight of the meeting was the day-long symposium on "Patents and the Advancement of Knowledge," an outgrowth of the controversy on inventing and patenting which appeared in a recent issue of *Technology and Culture* (Summer 1960). In this session, cosponsored by the society and by Section L, there was sharp criticism as well as strong defense of the existing patent system as a factor in the advancement of knowledge. J. William Hinkley (Research Corporation) presided over the first part of the symposium, in which Jacob Rabinow (Rabinow Engineering Company), Richard P. McGrail (American Cancer Society), and Johan Bjorksten (American Institute of Chemists) gave papers on various aspects of this subject.

Because of illness, Harry Woolf's scheduled vice-presidential address on "The evils of secrecy" was not given: an additional symposium panel was substituted, in which Melvin Kranzberg, editor-in-chief of *Technology and Culture*, introduced S. Colum Gilfillan (research sociologist) and I. Jordan Kunik (patent attorney, New York), who presented statements of their positions in the original controversy.

Robert L. Johnson (Temple) presided over the final session of the symposium, wherein Fritz Machlup (Princeton) and Charles C. Price (University of Pennsylvania) presented papers dealing with the economic and scientific incentives of the patent system. Rudolph F. Bannow (National Association of Manufacturers) introduced Robert C. Watson, who concluded the symposium by summing up some of his personal experiences as head of the U.S. Patent Office.

In a session on 19th-century technology, held jointly with AAAS sections L and M and presided over by Sidney Withington, Arnold R. Daum (Loyola) presented some new evaluations in the history of the petroleum industry and Thomas P. Hughes (Washington and Lee) indicated that the lag in the British electrical industry during the period 1882 to 1888 was caused by factors more complex than the legislation of

1882, to which it is customarily attributed. Bern Dibner of the Burndy Library commented on the papers.

A session held jointly with the History of Science Society featured a paper by Alexander M. Ospovat (University of North Dakota), on "Abraham Gottlieb Werner's ideas on science and education," and one by Harold I. Sharlin (Polytechnic Institute of Brooklyn), on "The engineering gap between Faraday's discovery of electro-magnetic induction and the electric dynamo."

Despite its formidable title—"Eilmer of Malmesbury: An eleventh-century aviator, a case study of technological innovation, its context and tradition"—Lynn White's presidential address enlivened the annual luncheon of the society. In a truly virtuoso performance, with wit and erudition, White showed how technological error persists despite the records of human experience. This luncheon was the capstone of this third annual meeting—a meeting which demonstrated the vast range of interests of this interdisciplinary organization, the advantages to be derived from bringing together the academician and the practicing technologist, and the vitality of this young and fast-growing society.

MELVIN KRANZBERG, *Secretary*

Nuclear Engineering

Nuclear engineering and its role in the engineering curriculum were the subjects of a panel discussion arranged by Section B (Physics) and Section M (Engineering) and held at the Biltmore Hotel, New York, on the morning of 30 December. John W. Healy (General Electric Company, New York) presided over a spirited discussion among the four panel members—Thomas B. Drew (Columbia), Irving Kaplan (Massachusetts Institute of Technology), John Lamarsh (Cornell), and V. Lawrence Parsegian (Rensselaer Polytechnic).

Nuclear engineering was generally defined as the branch of engineering involved with nuclear processes, and the nuclear engineer, as one with over-all competence in these processes. There was a difference of opinion among the panel members as to the distinction between nuclear engineering curricula and curricula of scope and depth in physics and in chemical, mechanical, and metallurgical engineering, particularly at the undergraduate level. In the graduate area, departments of nuclear engineering have a definite field of usefulness.

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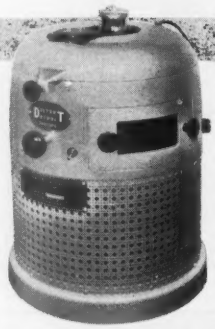

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Medical Sciences (Section N)

Section N held its annual symposium, organized along the conventional lines of an interdisciplinary discussion, from 26 to 29 December. The subject of the symposium, arranged by Abraham M. Shanes, was "Biophysics of Physiological and Pharmacological Actions." There were five half-day sessions.

The first session covered elementary systems. The chairman of this session was T. Shedlovsky (Rockefeller Institute). J. F. Hoffman reviewed the use of red-cell ghosts in studying transport phenomena. Robert L. Post (Vanderbilt) presented a very interesting concept of the relationship of adenosine triphosphatase activity to red-cell permeability. Existing relationships between this adenosine triphosphatase and the sodium pump were discussed. T. Hoshiko gave a lucid description of electrogenesis in frog skin. He emphasized that the transport mechanism for sodium is located at the corium facing membrane of the epithelial cell. S. Dikstein, of Jerusalem, presented evidence to show that model systems employing monomolecular layers of lipids gave characteristic actions of drugs that could be studied in relationship to the spatial distribution of functional groups. It will be interesting to follow the development of this approach to the mechanism of drug action.

The second session, which was concerned primarily with nerve, opened with a paper by J. D. Robertson (McLean Hospital, Boston). The current knowledge of intimate nerve structure as determined by electron-microscopic techniques was presented. In three papers which followed, the characteristics of the resting nerve cell, the theories of spike generation, and the current concepts of afterpotentials were reviewed and discussed. Of particular interest was the point made by F. A. Dodge, that the reduction of calcium and small depolarizations cause similar membrane changes. Very interesting evidence was presented by K. Kotetsu (University of Illinois) that sodium is dispensable for membrane excitation in certain excitable tissues. This complicates interpretation of many of the currently held concepts in this field.

The third session was concerned with a discussion of muscle. After presentation of the classical concepts of the properties of striated muscle, discussions on electrochemistry, the coupling of excitation and contraction, and the modification of action potentials were

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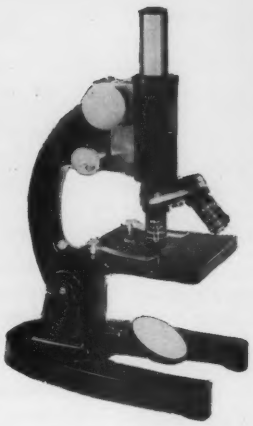

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presented. Of particular interest was a paper by W. Freygang on work done in collaboration with R. H. Adrian, in which he discussed anomalous rectification in muscle fibers. C. Paul Bianchi presented information on the action of caffeine on muscle contraction. He showed that caffeine may act through an action on calcium influx, which can occur in the absence of depolarization. A. M. Shanes (National Institutes of Health), who presented work on slow fibers, confirmed the importance of calcium as perhaps the most intimate link between membrane phenomena and muscle contraction. This is an extension of his earlier work on twitch fibers.

In the fourth session, on the contractile properties of muscle, the authors of papers attempted to correlate structure and function, but quite clearly this is a field which needs much more concentrated effort before even tentative relationships are well established. This is in no way meant to indicate that great strides have not been made in the energetics of muscle contraction.

The fifth and final session was concerned with cardiac muscle and smooth muscle. Brian Hoffman summarized the recent evidence bearing on the question of whether heart muscle, functionally, should be thought of as a syncytium or a group of individual cells. He also reviewed at some length the differences and similarities between the properties of nodal fibers and those of cardiac muscle fibers. J. W. Woodbury discussed the cardiac action potential and indicated, on the basis of electrochemical evidence presented, that it seems unlikely that the repolarization phase can be entirely explained on the basis of the rate of potassium efflux from the depolarized tissue. Leon Hurwitz (Vanderbilt) reviewed the electrochemistry of smooth muscle and its relationship to contraction. He emphasized that the calcium ion appears to have a depressing action on smooth-muscle excitability but at the same time is essential for smooth-muscle contraction. It would therefore appear that in striated, cardiac, and smooth muscle, depolarization is associated with calcium influx. L. Barr (University of Michigan) presented evidence of the importance of potassium in the functional activity of arterial smooth-muscle strips. When dog carotid artery strips were stored at 4°, he found that sodium was gained and potassium was lost. The ability to respond to stimuli was also lost. As the potassium ion concentration increased, contractility and the rate of relaxation following a stimulus increased, yet an optimum K_i/K_o was necessary for maximum excitability.

Although the title of the symposium included the "physiological and pharmacological actions," it was apparent from the papers presented that we are only now beginning to consider the pharmacological events at the cell membrane or in muscle tissue itself. It would appear that the more basic concepts of ion movement across cell membranes are reasonably well established. However, there is much to be learned before action potential, contraction of muscle, and so on can be thoroughly correlated with membrane activity. It would appear that pharmacological agents have been used less extensively than they might have been in the elaboration of mechanisms in these systems. The use of caffeine by Bianchi, cocaine by Shanes, and alcohol by Hurwitz indicates the valuable contributions of chemical agents employed as tools.

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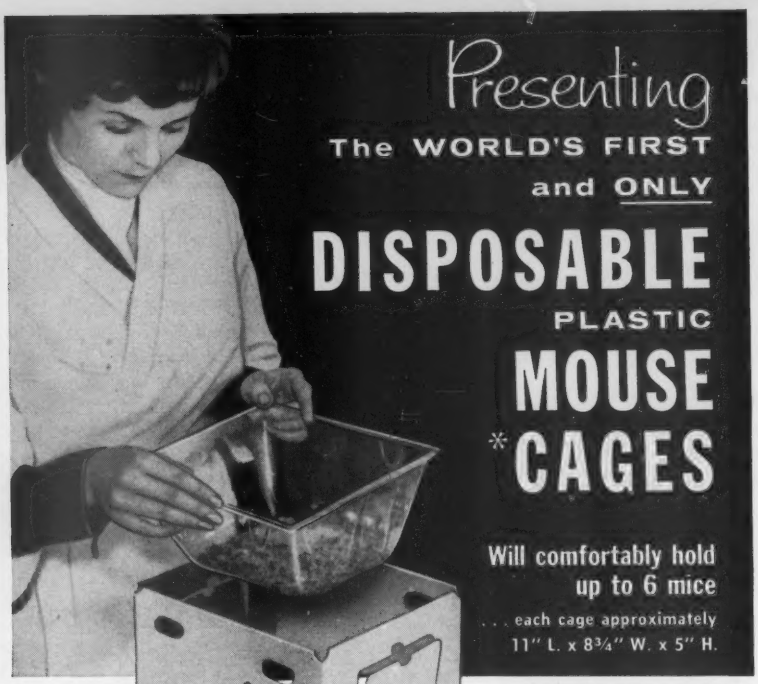

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lytic Association, centered around methods of study and psychological classification of certain emotional phenomena in the adult human being. A historically oriented introduction by P. H. Knapp, program chairman, stressed the need for convergence between biologic (particularly neurophysiologic) and psychologic (particularly psychoanalytic) advances in the study of emotional phenomena.

Papers by P. MacLean, on neurophysiologic interrelations between sexual, oral, and aggressive responses in the monkey and their progressive socialization during phylogenesis, and by Spitz, on the origins of emotional responses in infancy, continued the introductory theme. The symposium then focused on approaches to emotional expression within the evolutionary frame of reference by the use of newer media. A short film by F. Deutsch served to introduce discussion of the study of expressive manifestations at various levels—the lexical and linguistic, discussed by G. Mahl; the kinesic, discussed by R. Birdwhistell; and the visceral, discussed by J. Lacey, who brought forward the evidence of adaptive cardiovascular patterns facilitating intake or exclusion of environmental input.

In closing sessions K. Pribram discussed the neuropsychologic model which Freud had advanced in his *Project for a Scientific Psychology* as a sophisticated precursor of the type of unified model urged in the introductory presentation—a type which present-day communication theory is serving to elaborate. G Engel discussed problems of classifying emotions. D. Hamburg, in a paper amplified by M Mead, discussed evidence from contemporary primitive cultures, from historical anthropological investigations, and from animal studies, stressing the evolution of emotions and their adaptive role, particularly in forming social bonds.

PETER H. KNAPP, *Program Chairman*

Alpha Epsilon Delta (N1)

The symposium on "Career Opportunities in Medicine and Dentistry" cosponsored by Sections C–Chemistry, F–Zoological Sciences, N–Medical Sciences, and Nd–Dentistry, attracted an attendance of about 200 persons, including premedical and predental advisers and students. An exceptional program featured W. H. Stewart, chief of public health methods, U.S. Depart-

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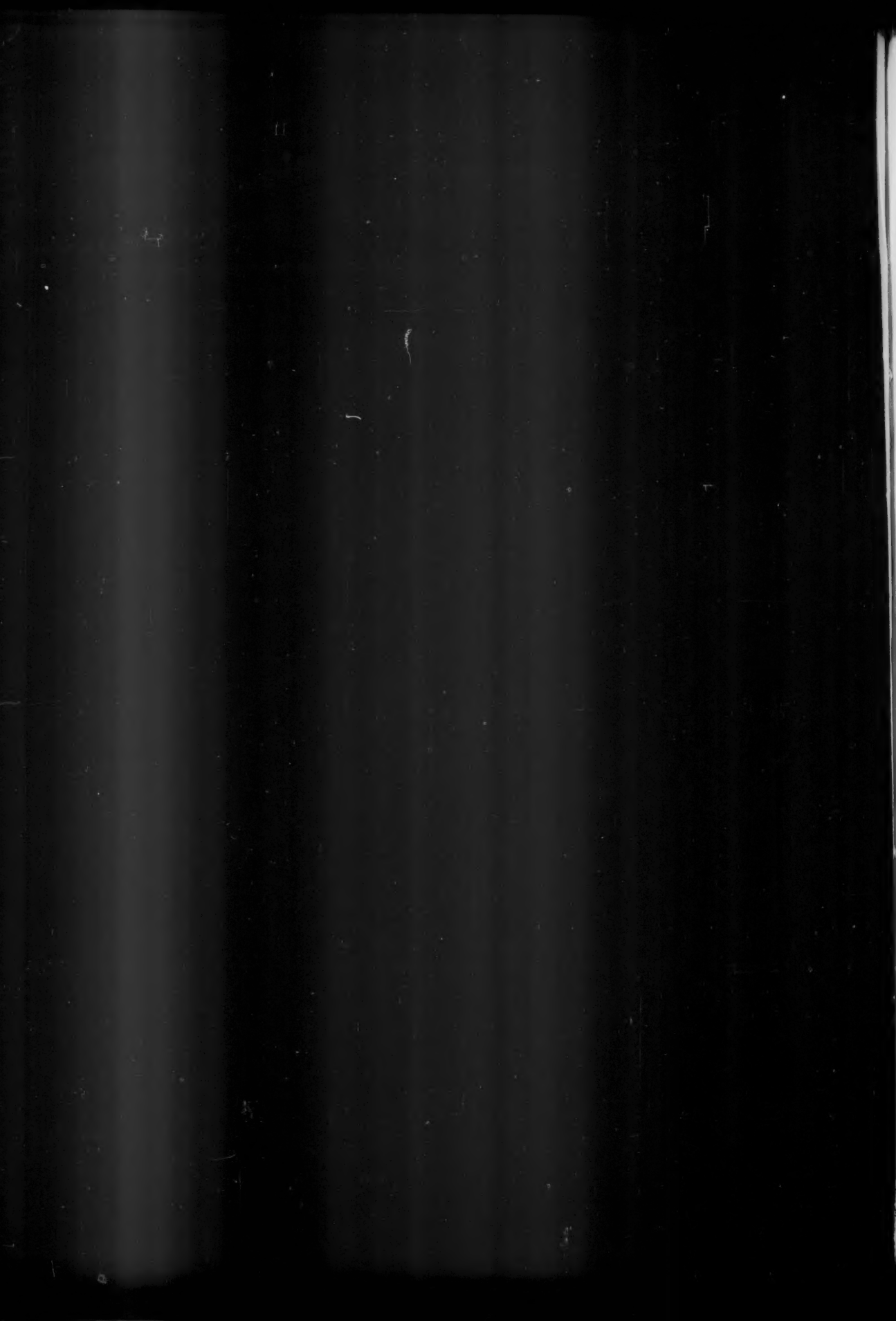

ment of Health, Education, and Welfare, and director of the study staff of the surgeon general's consultant group on medical education, whose report "Physicians for a Growing America" was recently published. Stewart presented a cogent outline of the physician needs for the future. The need for dentists was outlined by Shailer Peterson, secretary, Council on Dental Education, American Dental Association, and assistant secretary of the Association for Educational Affairs, who works very closely with the Association of American Dental Colleges on these problems. A panel discussion on opportunities in dentistry was moderated by Raymond J. Nagle, dean, New York University College of Dentistry, while the panel on opportunities in medicine was moderated by James O. Pinkston, associate dean and professor of physiology, Downstate Medical Center, State University of New York, Brooklyn.

A wide variety of career opportunities in medicine and dentistry were brought out during the discussion and in the question-and-answer period that followed. After the luncheon, I. S. Ravdin, vice-president for medical affairs, University of Pennsylvania, discussed "The doctor's dilemma" in solving the numerous complex scientific, professional, and social problems facing the medical and dental professions today in providing health care for the American people. The afternoon was devoted to informal conferences with admissions officials in attendance and visits to the medical and dental schools in the city.

Tentative plans are under way to sponsor a similar program at the Denver AAAS meetings in December 1961.

MAURICE L. MOORE, *Secretary*

Dentistry (Section Nd)

In keeping with the general program scheme of recent years, Section Nd again organized a multidisciplinary symposium on a topic basic to oral biology—*fundamentals of keratinization.*

The two-session symposium, held at the Biltmore Hotel on 30 December, was organized under the direction of Earl O. Butcher (New York University School of Dentistry), with cosponsorship by Section N (Medicine), the International Association of Dental Research (North American Division),

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the American Dental Association, and the American College of Dentists.

During the morning session (moderated by Butcher, section program chairman), various aspects of keratinization were discussed: (i) sequential mechanisms involved (A. G. Matoltsy, University of Miami); (ii) distribution of SH and SS reactions in various vertebrate keratins (R. J. Barrnett, Yale; R. F. Sognnaes, University of California, Los Angeles; G. Pettengill, Harvard); (iii) tissue culture keratinization (G. Szabo, Harvard); (iv) ultrastructure of keratinizing tissues (J. A. Rhodin and E. J. Reith, New York University); and (v) the effects of vitamin A on keratinizing tissues (H. A. Bern and D. J. Lawrence, University of California, Berkeley; J. P. Parnell and B. Sherman, State University of New York).

The afternoon session (moderated by Sognnaes) began with a discussion of physical properties of cornified epithelium (I. H. Blank, Massachusetts General Hospital) and proceeded to deal with structural and chemical aspects of oral epithelial derivatives—keratinization of the oral mucosa (J. Meyer and H. Medak, University of Illinois); keratin formation in dental cysts (J. J. Pindborg, Royal Dental College, Copenhagen); environmental and genetic effects on oral cornification (C. J. Witkof, Jr., National Institute of Dental Research); ultrastructural demonstration of the extracellular deposition of enamel (M. L. Watson, University of Rochester); and the microchemical constituents of the enamel protein (K. A. Piez, National Institute of Dental Research).

The symposium was well attended; at times the Biltmore Suite was filled to capacity (150), and there was a good deal of audience participation. During the morning session discussion centered around the definition of keratinization versus cornification, and the appropriateness of the classical terms "hard" and "soft" keratin. On the basis of the distribution of SH and SS reactions, a classification by site and origin was suggested as most appropriate by one discussant (Barrnett). During the afternoon session discussion of the enamel protein resulted in rejection of the views that this curious epithelial product is either a typical keratin or a collagen. It arises extracellularly, unlike typical keratins, and it contains no hydroxyproline, unlike collagen. One discussant (Pautard, Leeds University) even suggested that the enamel matrix may resemble a silk protein in structure. This may have important implications with respect to concepts of calcification.

In addition to sponsoring its own program, Section Nd cosponsored a meeting on career opportunities in medicine and dentistry, arranged by Alpha Epsilon Delta, which attracted a large audience on the morning of 29 December in the music room of the Biltmore. After introductory remarks (C. V. Reichart, Providence College), two comprehensive reports were presented, on future needs for physicians (W. H. Stewart, U.S. Department of Health, Education, and Welfare) and future needs for dentists (S. Peterson, American Dental Association). The remainder of the morning was devoted to two panel discussions on challenges in store for psysicians and dentists. The panel dealing with career opportunities in dentistry was moderated by R. Nagle (New York University College of Dentistry), with discussants from several Eastern dental schools—J. A. Cuttita (Columbia), M. M. Maxwell (Seton Hall), W. A. Wilson (Fairleigh Dickinson), J. H. Oaks (Harvard), L. W.

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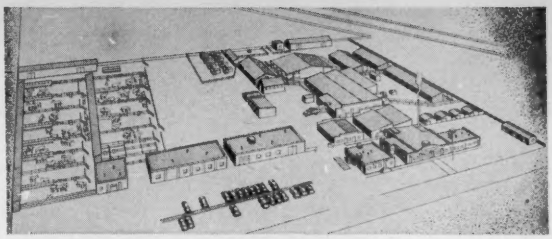

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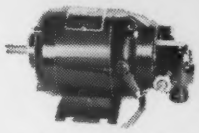

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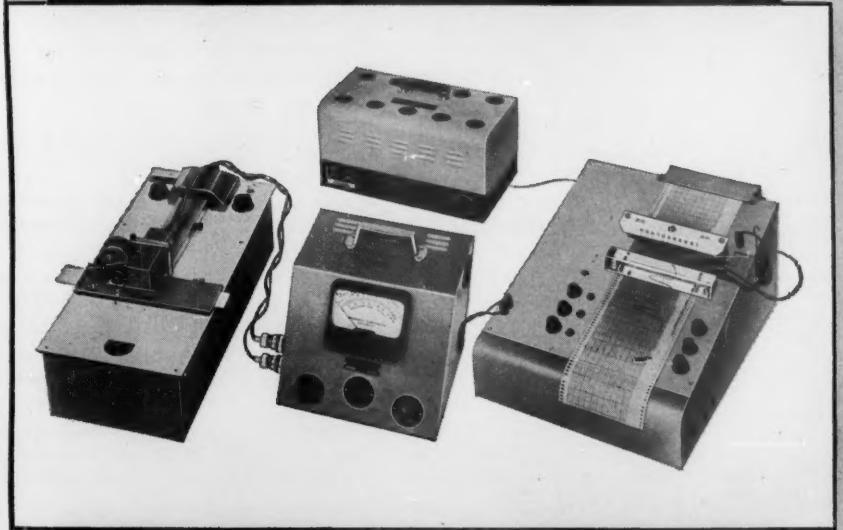

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After a group luncheon, with an address by vice president I. S. Ravdin (University of Pennsylvania), opportunity was provided for individual conferences with college admission officials and for visits to local professional schools.

Harold J. Noyes, dean of the University of Oregon Dental School, was elected to succeed Joseph L. T. Appleton as vice president and chairman of Section Nd (for 1961). Albert A. Dahlberg (Zoller Memorial Dental Clinic and department of anthropology, University of Chicago) was elected committeeman-at-large, to succeed Joseph C. Muhler, who has completed his 4-year term of office.

The secretary took official notice of the great loss the organization had sustained in the untimely death of two very distinguished members—Balint Orban and Joseph P. Weinmann, both of the School of Dentistry, University of Illinois, and both active researchers in the area covered by the symposium on keratinization.

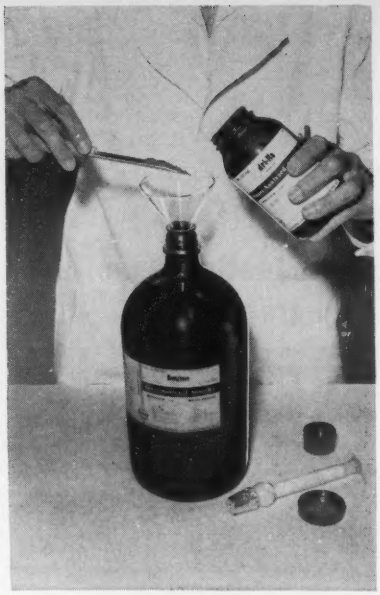
REIDAR F. SOGNNAES, *Secretary*

Pharmacy (Section Np)

Section Np held eight sessions from 27 through 30 December. A total of 43 contributed papers on various studies was reported, and one symposium was held jointly with the Committee on Cosmetics of the American Medical Association. Over 450 persons registered as having attended one or more of the section meetings.

The AAAS Council, the governing body of the Association, elected Joseph A. Oddis (American Society of Hospital Pharmacists) a vice president of the Association and elected Lee H. MacDonald (Upjohn) to serve on the committee-at-large of the section for a 4-year term. Oddis will serve as chairman of the section for the coming year and will preside at the Denver meeting in December 1961. John E. Christian (Purdue) continues to serve as secretary of the section.

Of major interest to the group in attendance was a stimulating vice-presidential address entitled "Dedication to Pharmacy," presented by Joseph V. Swintosky. A symposium entitled "The Scientist's Contribution to the Safe Use of Cosmetics" also attracted considerable interest, not only on the part of the pharmaceutical scientists in



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attendance but also on that of many individuals from other scientific disciplines and of cosmetic scientists located in the New York area. Over 300 persons attended each of the two sessions.

In addition, the hospital pharmacy group had a most informative and well-attended full-day session of discussions and contributed papers on the scientific aspects of hospital pharmacy, under the guidance of George F. Archambault and Joseph A. Oddis. The following groups were represented: the American Society of Hospital Pharmacists, the American Pharmaceutical Association, the New York State Council of Hospital Pharmacists, the American Hospital Association, and the American Association of Colleges of Pharmacy. Luncheon, entertainment, and dinner were sponsored by E. R. Squibb and Sons, Wyeth Laboratories, and McKesson and Robbins, respectively.

John Autian (College of Pharmacy, University of Texas) opened the first session for contributed papers which consisted of presentation of the results of original scientific investigations. Norman J. Doorenbos and his coworkers at the University of Maryland presented a series of six papers describing work recently completed on the synthesis of aza steroids. C. E. Breckinridge (Oak Ridge National Laboratory) and J. E. Christian (Purdue) discussed a new method for isotope dilution analysis of chlorotetracycline. The polarographic properties of some pyridine derivatives were explained by Nicholas G. Lordi (Rutgers).

The effects of corticosteroids and tranquilizers on experimental amebiasis was discussed by James Ingalls (Long Island University). Lee H. MacDonald (Upjohn) described comparative testing of preservative systems. Other papers presented before the first session were "Comparative pharmacology of diphenylmethane derivatives," "Modification of the action of chloral hydrate in mice by the prior administration of nicotinamide," "Facilitation of metrazol-induced seizures by iproniazid," "Structural consideration of steroid borates," "The effect of ultrasound on the production of microcrystalline progesterone," and "Evaluative procedures for film-forming materials used in pharmaceutical applications." These papers were presented by Arlan G. Roberts (J. B. Roerig and Company), Robert G. Brown (University of Texas), Albert M. Ellman (Rutgers), George M. Sieger (Led-

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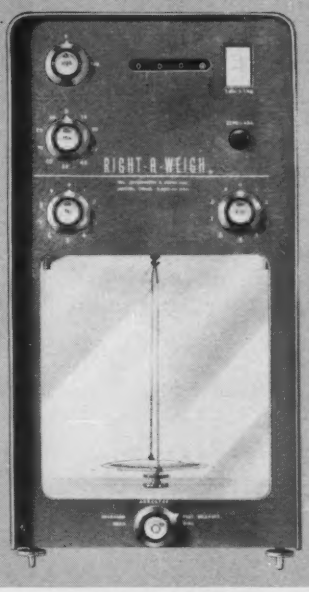

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erle), Donald M. Skauen (University of Connecticut), and Joseph L. Kanig (Columbia), respectively.

Lee H. MacDonald opened the second session of contributed papers and presided over the meeting. The papers presented were as follows: "A discussion of the electro-magnetic wave theory," "A comparison of operating characteristics of a liquid and plastic scintillator," Sterilization of regenerated collagen with beta-propiolactone," "Re-evaluation of certain atomic refractions," "Growth of medicinal plants in culture," "Description of a volatile oil obtained from a plant indigenous to Louisiana," "A continuous practical method for production granulation," "Binding of cations and anions by a nonionic surface active agent," "A technique for studying thermally induced phase transitions," and "The synthesis of 2-methyl-2-phenyl-3-(dialkylaminoalkyl) benzothiazolines and 2,2, - dimethyl - 3 - (dialkylaminoalkyl) benzothiazolines as potential tranquilizers." These papers were presented by Harry Lobel (Nebraska Iowa Electrical Council), George Foster (Purdue), Edwin L. Ball (Lederle), P. J. Jannke (University of Connecticut), A. E. Demaggio (Rutgers), John T. Goorley (Northeast Louisiana State College), E. T. Martin (Merck, Sharp, and Dohme), P. P. De Luca (Temple), D. R. Reese (Smith, Kline, and French), and C. S. Davis (Purdue), respectively.

This was one of the most successful meetings Section Np has held and was exceedingly well attended.

JOHN E. CHRISTIAN, *Secretary*

Safe Use of Cosmetics

The symposium, "The Scientist's Contribution to the Safe Use of Cosmetics," cosponsored by the Committee on Cosmetics of the American Medical Association and Section Np (Pharmacy) of the AAAS, met for two sessions on 29 December. Nine papers were presented, indicating ways in which the research biologist, the dermatologist, and the cosmetic chemist could work together to formulate safer cosmetics and outlining the responsibilities of manufacturers and the government with respect to the marketing of cosmetic products.

In presenting the research biologist's view, William Montagna (Brown) discussed some problems of biological research related to the development and use of cosmetics, with particular refer-

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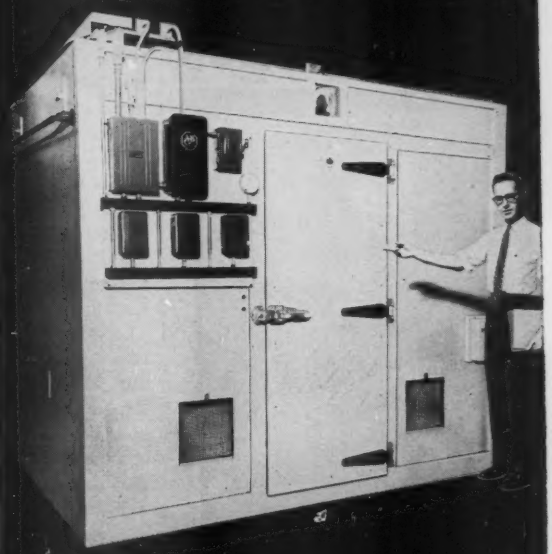

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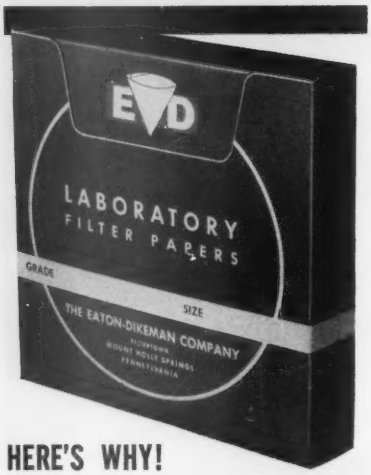

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ence to the degree to which the ingredients of various cosmetics penetrate human skin. Kenneth Wilson (U.S. Army Chemical Research and Development Laboratories) discussed new methods for the study of percutaneous absorption. He presented slides and a film illustrating the methods that he uses to study skin penetration, including radioisotope tracer methods and an improved technique of preparing a perfused skin flap. William Bousquet (Purdue) discussed the general properties of radioactive isotopes as well as ways in which tracer techniques should prove valuable to the cosmetic scientist and manufacturer. Glen Sperandio (Purdue) discussed the qualifications of a cosmetic chemist, standards for a "safe" cosmetic, and a formulation technique that can be used to achieve such standards.

Allan Lorincz (University of Chicago), speaking from the standpoint of the dermatologist, stated that dermatologic research should play a fundamental guiding role in the formulation of cosmetics. Types of reactions which the dermatologist encounters in his practice were discussed by Howard T. Behrman (New York) along with causal mechanisms, clinical features, diagnosis, and therapy. Adolph Rostenberg (University of Illinois) gave an evaluation of currently used methods of appraisal for potential hazard, indicating their limitations and the need for better screening techniques.

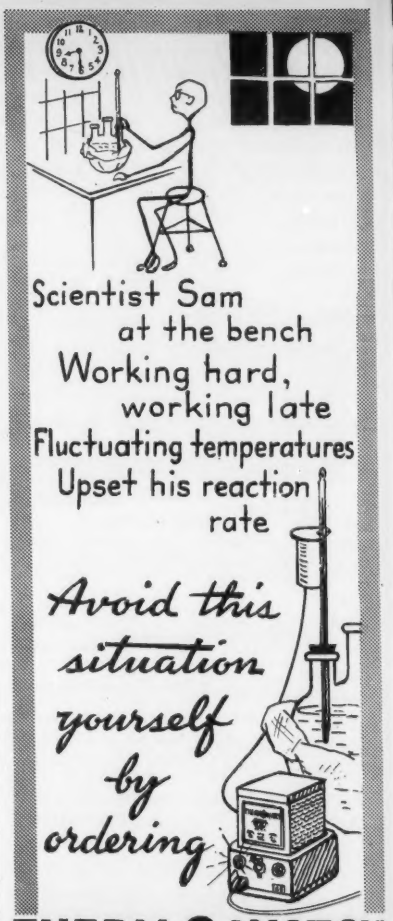
Willard Bright (Lever Brothers) indicated that the industry wants to market only safe cosmetic products and, to this end, is sponsoring ever-expanding company research programs and cooperating more and more extensively with both scientific investigators and U.S. Food and Drug Administration representatives. Irvin Kerlan (U.S. Food and Drug Administration) outlined the government's role in the control of cosmetics.

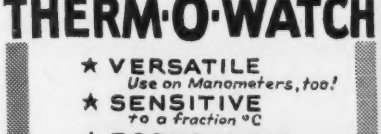
Extensive and lively discussion periods followed the afternoon and evening programs.

JOSEPH B. JEROME,
Symposium Secretary

Agriculture (Section O)

Section O followed the precedent of recent years in designing a symposium program to illuminate a major national problem of great concern to everyone, but one in which leadership may well rest with the agricultural segment of





the economy of the United States. This year's symposium, "Land Zoning in Relation to Agricultural, Suburban, Industrial, Forest, and Recreational Needs of the Future," was divided into five sessions of a half-day each, synchronized with an additional AAAS-sponsored half-day session on urban redevelopment (the complementary phase of land planning and use).

The entire symposium involved a wide range of disciplines; thus AAAS members affiliated with Section O were given an opportunity to review broad subject-matter areas in a way not generally provided by any individual scientific society in its own programs. The attendance at the various sessions totaled about 625. These audiences were composed of responsible professional, scientific, and civic leaders from many states, who are deeply concerned with land planning, land zoning, and land use to meet the needs of the whole population in the near future and the decades beyond.

The entire program was developed and directed by vice president Firman E. Bear, 1960 section chairman. The excellence of the program was insured by the participation of speakers of outstanding ability who have made notable contributions in this field. Part 1 dealt with rural land zoning, with Wallace D. Bowman of the Conservation Foundation serving as chairman. Speakers at this session were D. A. Williams (Soil Conservation Services), E. D. Solberg (Agricultural Research Service, U.S. Department of Agriculture), Karl J. Belser (Santa Clara County, California, Planning Department), and T. W. Schulenberg (Department of Commerce and Public Relations, Indiana).

Part 2 dealt with suburban planning, under the chairmanship of Louis Wolfanger (Michigan State University). Four phases of this subject were developed by H. R. Pomeroy (West Chester, N.Y., County Planning Department), L. J. Bartelli (U.S. Soil Conservation Service), Marion Clawson (Resources for the Future, Inc.), and G. F. Whitehead and Robert Kates (University of Chicago).

Part 3, which followed the AAAS program on urban renewal, concentrated on community planning, under chairman Byron E. Munson (Ohio State University). Rural, county and regional, and small city communities were included. The speakers were H. H. Smith (Community Planning Associates), G. H. Deming ([New York]

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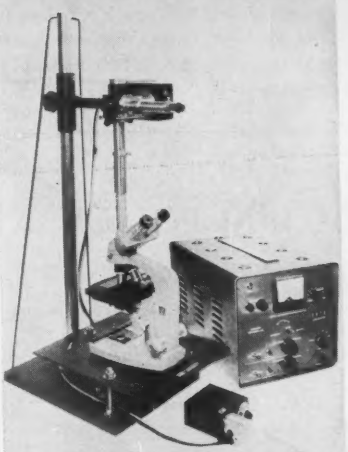

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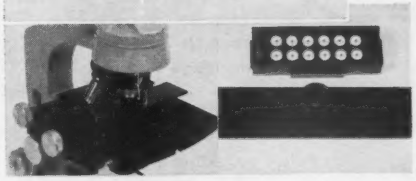

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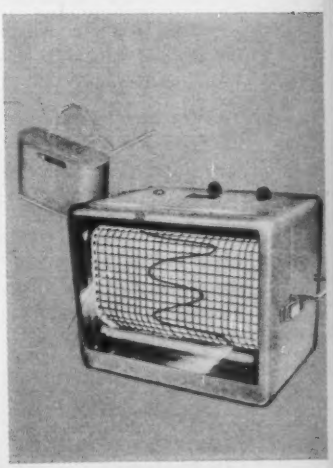

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Conference on Metropolitan Area Problems), S. S. Farness (Tri-County Regional Planning Commission, Lansing, Michigan), and W. J. Wayne (Indiana Geologic Survey).

Part 4 on forest and recreational planning, was presided over by Edward Higbee (University of Delaware). Four phases of this subject were discussed, by Paul B. Sears (chairman, conservation program, Yale), Charles W. Eliot (planning consultant, Cambridge, Massachusetts), Edward C. Crafts (U.S. Forest Service), and Raleigh Barlowe (Michigan State University).

Part 5 concluded the symposium with a program on "Government as Land Owner and Redistributor"; William Miller (New York University) was chairman of the session. The following four speakers developed this subject: Max S. Wehrly (Urban Land Institute), Shirley A. Siegel (Assistant Attorney General for New York State), Charles Abrams (planning consultant, New York City), and Robert E. Lowry (Tennessee Valley Authority).

The symposium was most successful in bringing the problem of land planning and land use for the public welfare into sharp focus. The many aspects of the subject were clearly presented; the amount of information and experience already available from regional and national leaders and specialists is substantial and all that is now needed is the dissemination of this information to communities and regions that will carry the responsibility for action.

The election of Wynne Thorne as a vice president of the AAAS and 1961 chairman of Section O was confirmed by the Council. Thorne succeeds Firman E. Bear, who was elected to a 4-year term as a committeeman-at-large. Thorne, director of the Utah Agricultural Experiment Station, has accepted the responsibility for developing a symposium program for the 1961 Denver meeting on the agricultural potential and development of the Great Plains and the Intermountain Regions.

HOWARD B. SPRAGUE, *Secretary*

Education (Section Q)

The New York meeting was the most successful meeting for Section Q in many years. The programs attracted a large attendance. At meeting after meeting there was standing room only, and in some instances substantial numbers had to be turned away, though one program—an evening program on 30 December—was poorly attended.

The quality of the programs seemed better than in former years. It was gratifying to note the attendance and the vigorous and constructive contributions of colleagues from the academic disciplines in many of the Section Q programs.

Section Q cosponsored two sessions with the Council for Exceptional Children and two sessions with the American Educational Research Association. The teaching societies sponsored their usual extensive and diversified programs. Section Q sponsored four sessions of contributed papers and the vice-presidential address. One session of contributed papers was concerned with problems associated with education of the gifted student. Another focused on the instructional problems associated with the use of educational television. The other two sessions were more varied but reflected interest in the cultural and social factors associated with discipline and vandalism, at-

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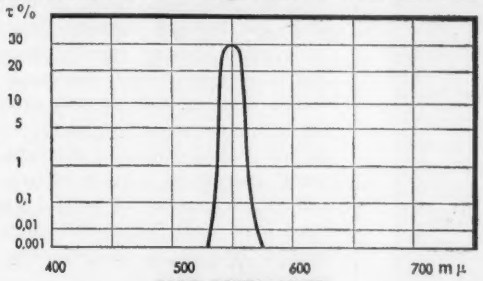

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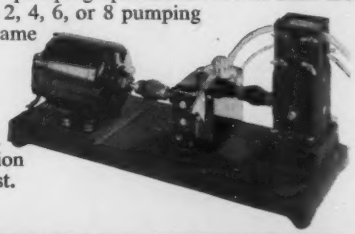

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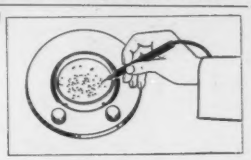

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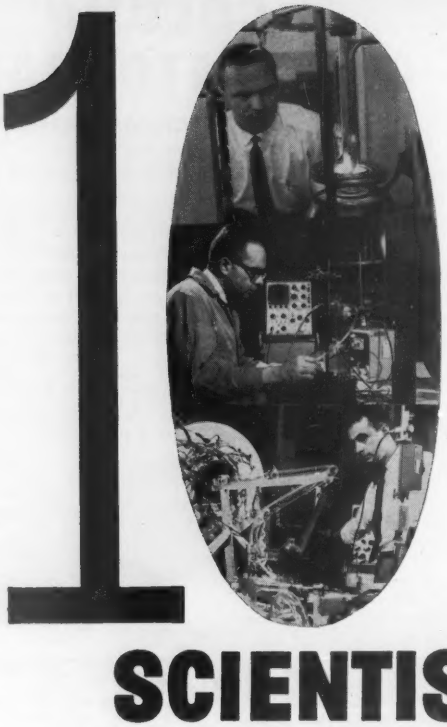

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titudes, vocational choices, and other problems.

A symposium on data-processing machines and educational research was provocative and stimulating. John C. Flanagan's vice-presidential address was devoted to a discussion of the educational implications of the research investigation "Project Talent," which he directs.

The section committee met formally on the day prior to the annual business meeting and met again, informally, after the business meeting. Problems of communication, future programs, and other matters were discussed.

The business meeting was probably the best attended in the history of the section. Participation was excellent, and great interest in section affairs was evinced. A number of helpful suggestions were made, which will guide the Section officers in meeting their responsibilities.

HERBERT A. SMITH, *Secretary*

The Retarded Child

The joint session of Section Q and the Council for Exceptional Children, on 26 December, was very successful. There were about 175 persons in the audience. Margaret Giannini, talked on the etiological and diagnostic aspects of the retarded child. She made it very clear that mental retardation is not an illness in itself, and that we must know about the pathological causes of retardation in order to truly understand and plan a program for mentally retarded children.

Lawrence Taft discussed "pseudoretardation." He stressed the importance of team work in diagnosis and in clinical therapy. Elsa Haussermann made a plea for a thorough evaluation and a team of professional persons to work with retarded children, especially with children who have serious multiple handicaps—children that she called "special specials." William C. Barger stressed the importance of team work, then narrowed his discussion to aphasiac children and told of success in using the mirror board with these children. The audience asked many questions, and nearly half of them remained to see special slides of work with aphasiac children.

The audience of the morning session on 27 December was smaller but gave close attention to the speakers. Emphasis at this session was on the education of handicapped children, although two of the speakers discussed problems

with gifted children. Raphael F. Simches listed trends in the education of special children and then discussed briefly some of the problems that are arising because of these trends and described expansion of work with the special children.

Romaine P. Mackie discussed research that is needed in working with all types of special children. She said that a terminology is very important, in order that mechanical cards can be used in research. She said that research is needed for the child, for parents and their needs, and for the teachers. She urged that research be reported in such a way that it can be understood.

I. I. Goldberg gave a description of a research project with preschool, mentally retarded children. The study will compare children in regular classes who have had this preschool training with others who have not had the training.

The audience asked many questions of all three speakers, and time was called before all of the questions could be heard. This seems to be one proof of an excellent meeting.

KATHERINE D. LYNCH,
Program Chairman

Research Symposium (Q4)

"Research and implications in teaching science," in the elementary school, in the secondary school, and at the college level, was the subject of the Research Symposium of the National Association for Research in College Teaching. The speakers were Cyrus W. Barnes (New York University), Hubert M. Evans (Teachers College, Columbia University), and Nathan S. Washton (Queens College).

NATHAN S. WASHTON, *Program Arranger*

National Science Teachers Association (Q5)

The theme of the sessions of the National Science Teachers Association meeting with the AAAS was "The New Science—A Teaching Challenge." The papers, each by a distinguished scientist, presented recent developments in five different areas of science. Each paper was followed by a discussion, by educational specialists, of the significance of the information presented by the speakers for elementary and secondary classrooms.

Alfred B. Garrett (Ohio State University) spoke on "The new chemistry." Wasley S. Krogdahl (University of Kentucky) dealt with "The new astronomy." Hugh Odishaw (U.S. Na-

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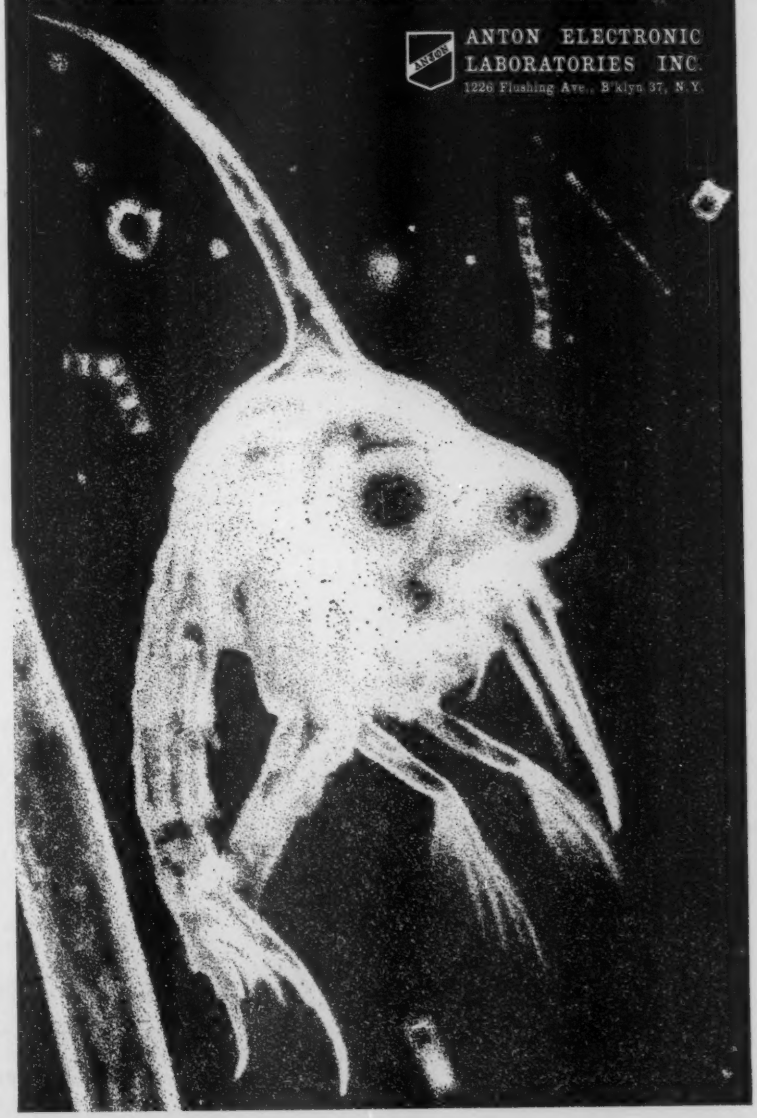

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tional Committee for the International Geophysical Year) spoke on discoveries in earth science resulting from IGY activities. Harry Wexler (U.S. Weather Bureau) discussed recently developed methods in weather forecasting. The fifth paper in the series, by Irvin J. Kopin (National Institute of Mental Health), was "The biology of the mind." Kopin discussed the biochemical bases for human behavior.

In addition, three IGY films were shown and a program on current NSTA activities was presented.

The coffee hour for members of the American Nature Study Society, the National Association of Biology Teachers, the National Association for Research in Science Teaching, and NSTA was a pleasant occasion and was well-attended by members of all four societies.

MARGARET J. MCKIBBEN,
Program Chairman

Academy Conference (X1)

The Academy Conference program opened on 26 December with a session on junior academies, with E. M. Gurr (Central High School, Phoenix, Arizona) presiding. The status of the junior academy movement and problems of organization and operation were discussed by Harry Bennett and Wayne Taylor, respectively. This presentation was followed by a panel discussion on the projected programs of junior academies, with Gerald Acker, Bennett, Elnore Stoldt, Taylor, and Floyd West as participants.

The morning of 27 December was given over to the business meeting and discussion of activities of the academies of science. A considerable part of the discussion centered around the relationship of junior academies to senior academies and the sponsorship of all junior science programs. The consensus was that the senior academies were in the best position to head up the varied programs directed toward the development of future scientists. The meeting was closed with the election of officers. E. Ruffin Jones (University of Florida) and J. Teague Self (University of Oklahoma) were chosen as president-elect and secretary, respectively.

The afternoon session was devoted to a discussion of the utilization of National Science Foundation grants by academies of science. Programs of four states were discussed by James Rutledge (University of Nebraska), John

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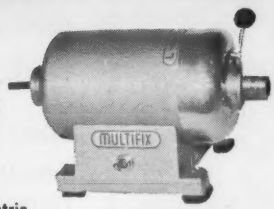

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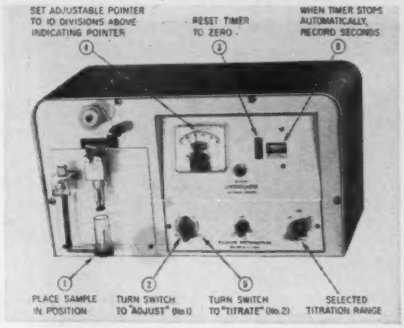

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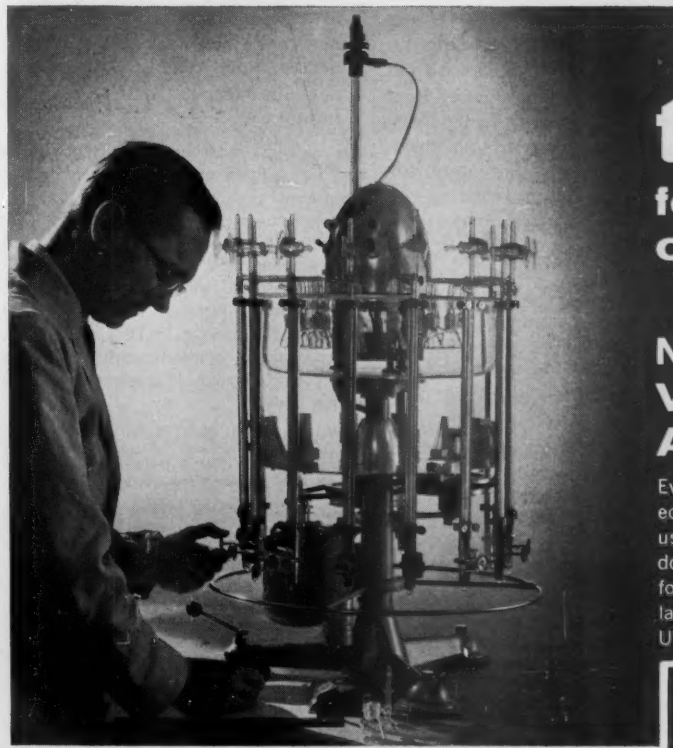

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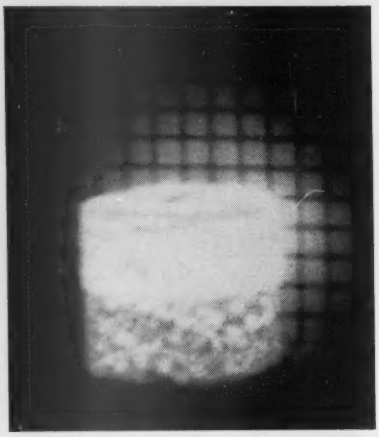

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Yarbrough (Meredith), and Arlo Smith (Southwestern University of Memphis). Charles La Motte (Texas A. and M.), who was to have been the fourth participant, was unable to be present but provided copies of his talk.

The traditional banquet featured the presidential address by John G. Arnold, Jr. (Loyola). His topic was "The fate of our junior scientists."

A. M. WINCHESTER,
Program Chairman

Junior Scientists' Assembly

At the 14th annual Junior Scientists' Assembly, held in the auditorium of the American Museum of Natural History on 27 December, each of the first 500 "early birds" received a copy of a Science Study Series paperback donated by Doubleday and Company.

Miss Evelyn Morholt welcomed the audience of some 1100 students (and some parents). Donald Barr (School of Engineering, Columbia) spoke on the "Image of the scientist."

Two students reported on their own research, conducted at Roscoe Jackson Memorial Laboratory: Judy Dick (Erasmus High School) described her work on learning in mice and on socialization of puppies; Robert Kamen (Andrew Jackson High School) told of the effects of nitrogen mustards on congenital deformities in mice and used slides to illustrate his talk. John Fuller, assistant director of the student-training program, described the objectives of the laboratory program for high school students, emphasizing the opportunity the program gives them to read original sources and do creative work.

Barr described the objectives of the Saturday Honors Program in Science, sponsored by the School of Engineering at Columbia University, and two students in this program described their work. Michael Steinitz (Harrison High School) described work on sapphire crystals and Erwin Morton, Jr., (Horace Mann High School) spoke of problems of thrust and fuels for rockets.

Conrad Ronneberg described the aims of the National Science Foundation in providing summer science institutes for high school students and described the kinds of courses to be offered in 1961.

During a closing question period, students (and some parents) asked questions about the supervision of students in out-of-town National

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Science Foundation courses; about methods of selecting students for honors programs under the foundation; and about specific problems in the papers presented by the four students.

EVELYN MORHOLT,
Program Chairman

American Association of Scientific Workers (X2)

The American Association of Scientific Workers held a round-table discussion on "Obstacles to the Application of Science to Human Welfare," on 27 December. Topics discussed were the economic and social factors that impede possible applications of science to human welfare; the misdirection of science into destructive channels; and the responsibilities of scientists in removing these obstacles, furthering human welfare, and maintaining peace and human freedom.

The main speakers were Otto Nathan (New York University), who spoke on "Science and peace"; Theodor Rosebury (Washington University), who spoke on "Reflections on the crisis in medicine"; Nathan S. Kline (Rockland State Hospital, Orangeburg, N.Y.), who spoke on "Cybernetics and human welfare"; and William H. Meyer (U.S. Representative from Vermont), who spoke on "Deficiencies in science and man."

A period of discussion followed; members of the panel were David Singer (University of Michigan), Lawrence Scott (Fellowship of Reconciliation), and George Yevick (Stevens Institute of Technology).

MIRIAM L. YEVICK,
Program Chairman

American Geophysical Union (X4)

The symposium on the impact of space research on science was held 27 December in the Bowman Room of the Biltmore Hotel, with E. Purcell of Harvard University and Brookhaven National Laboratory presiding. The hall was filled to capacity.

Gordon MacDonald (University of California, Los Angeles; currently on leave to the Goddard Space Flight Center, National Aeronautics and Space Administration) led off the symposium with an excellent account of the relationship between the earth sciences and the space program. He surveyed

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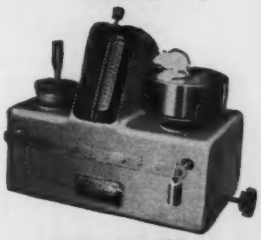
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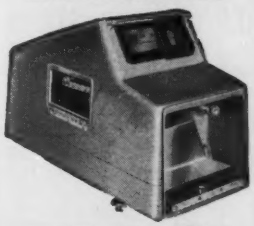
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the geodetic data resulting from the satellite orbit analyses and the implications of the satellite results for the structure of the earth's interior. He discussed the satellite meteorology program, emphasizing the importance of infrared detectors in future NASA weather satellites, as opposed to the cloud-cover photographs on which emphasis was placed in the preliminary Tiros operation. MacDonald also discussed the determination of atmospheric properties from the analysis of satellite orbits. He pointed to the possibility of a magnetic drag as a source of the fluctuations in satellite deceleration at altitudes above 400 kilometers.

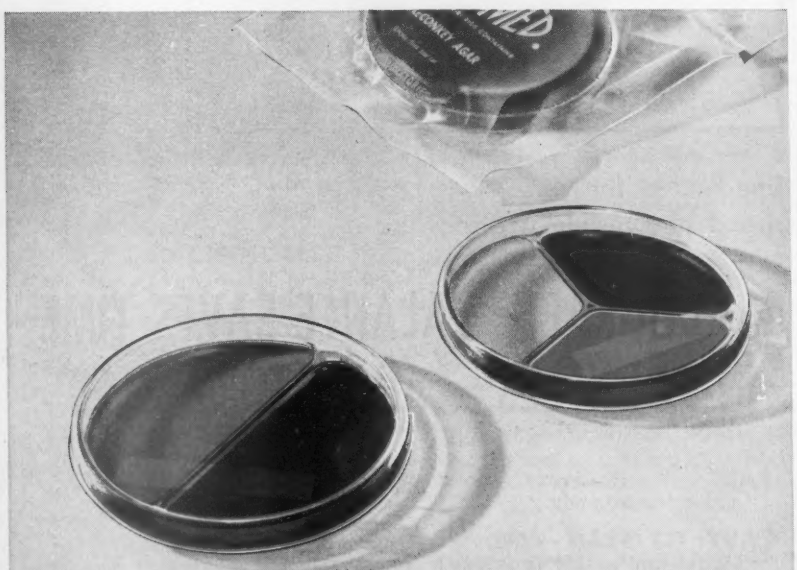
In the second lecture, Philip Abelson, director of the Geophysical Laboratory of the Carnegie Institution, discussed the suitability of extraterrestrial environments for the growth of living organisms. Abelson summarized the available body of information on the atmospheres of the moon, Mars, and Venus, in the context of conditions known to be suitable for the development of living organisms on earth. He stressed the improbability of finding living organisms on or near the surface of the moon, in view of the almost certainly dehydrated condition of the surface of that body. He considered it probable that the surface of Venus is also barren, as a consequence of the high temperatures which have been reported for that planet by radio astronomers. Abelson concluded with a critique of the evidence for the existence of living organisms on Mars. He pointed out alternative explanations in terms of reactions involving inert substances only.

In the concluding lecture, Martin Schwarzschild, of the department of astronomy, Princeton, discussed some of the benefits which would accrue to astronomy from the availability of orbiting telescopes. Schwarzschild envisioned that almost every field of astronomy would benefit substantially from the space program. One of the more fundamental problems that he discussed pertains to the amount of matter in the universe. There is indirect evidence for the existence of some ten times more matter than can be directly observed by currently available techniques. It is a matter of the greatest interest and importance to determine whether nine-tenths of the matter in the universe is in fact unaccounted for as yet, and if this is the case, what the composition of this missing matter may be. Current speculations center on the possibility that the unseen matter may be molecular hydrogen or deuterium. It is expected that the answer to this question will be obtained when satellite telescope spectrographs become available, a few years hence. Schwarzschild also discussed several questions of general interest to the scientific community, including the relative merits of manned and unmanned space exploration and the general benefits which may accrue to science as a whole from the investigations now being undertaken in support of space research.

ROBERT JASTROW, *Program Arranger*

American Nature Study Society (X5)

The 53rd annual meeting of the American Nature Study Society had a program indicative of the American people's increasing interest in interpretive nature programs for their schools. Sessions on outdoor laboratories, on nature projects of members, and on glaciation, and the showing of



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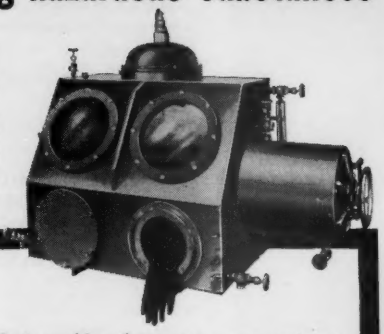

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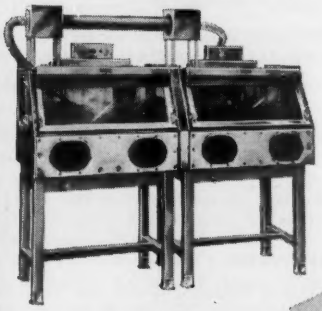

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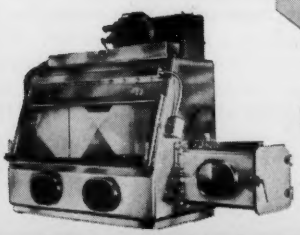

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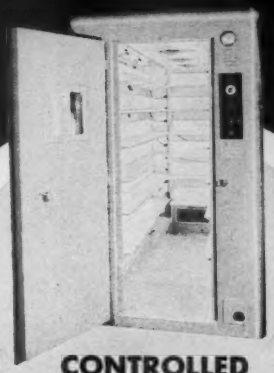

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kodachromes, attracted over 100 people.

The field trip to the Brooklyn Botanical Gardens, jointly sponsored by the Society and the National Association of Biology Teachers, was led by Charles Mohr and Shirley Miller. At the gardens, Frances Miner and George Avery, aided by staff members and children, explained and demonstrated their youth program.

Approximately 80 members and guests attended the annual banquet, arranged by John Ripley Forbes. Emery L. Will, president, introduced the speaker, Edwin Way Teale, who gave an illustrated talk on his *Journey Into Summer*.

On the last morning a joint session, arranged by Mohr, with the Photographic Society of America centered on new approaches, techniques, and evaluation in nature photography. During the final session a panel discussed writing, illustrating, and publishing for the nature audience.

The council held four meetings. Eva L. Gordon and C. M. Goethe were made honorary life members in recognition of their service to the cause of nature education. E. L. Palmer was reappointed representative to the AAAS Council. A committee was appointed to develop, in cooperation with the American Camping Association, criteria for certification of nature counselors. It was also planned to expand the services of the society through its newsletter and through development of a broader interpretive program at the local level.

STANLEY MULAIK, *Program Arranger*

Conference on Scientific Manpower (X7)

This year's general topic for the conference was "Developing Student Interest in Science and Engineering." Five papers were presented, in a morning session on 27 December.

Samuel Schenberg (New York City Board of Education) served as conference chairman. Harold H. Edgerton (Richardson, Bellows, Henry and Company) discussed "Summer research experience for high school students." John C. Flanagan (American Institute of Research) discussed the development of scientific aptitude tests and "Project Talent" as a means of identifying scientific abilities in high school students. M. H. Trytten and Lindsey Harmon of the National Research Council reported on a recent

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study of the high school backgrounds of recipients of doctoral degrees in 1958, from the standpoint of ability levels, region, class size, and field of study. Phoebe H. Knipling (Arlington County, Virginia, Public Schools) discussed the beneficial motivational aspects of science fairs. Finally, Richard T. Fallon (Michigan State University) described the program of the Junior Engineering Technical Society.

The conference was sponsored by the Engineering Manpower Commission, the Scientific Manpower Commission, the National Research Council, the National Science Foundation, and AAAS Section M. Papers delivered at the conference will be published and will be available in limited numbers from the National Science Foundation, Washington, D.C.

THOMAS J. MILLS, *Program Chairman*

National Association of Science Writers (X9)

Earl Ubell, president, conferred honorary membership certificates on Henry A. Wallace, Warren Weaver, and Paul Dudley White for exceptional cooperation in communicating science news to the public.

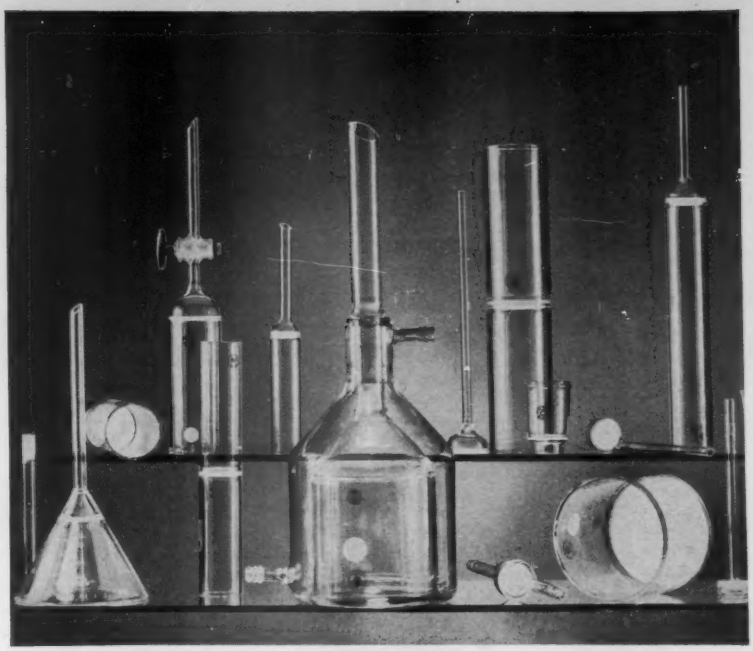
Lifetime membership certificates were awarded to Watson Davis, David Dietz, Thomas R. Henry, William L. Laurence, Herbert B. Nichols, Robert D. Potter, Allen Shoenfield, Jane Stafford, and Marjorie van de Water.

Watson Davis, director of Science Service, was named the association's 1960 nominee for the Kalinga prize, international award for popularizing science.

The members authorized an increase in annual dues from $10 to $15 and publication of a sample issue of what may become a regular supplement to the NASW *Newsletter*, to include samples of current newspaper and other science writing throughout the country. The members also authorized consideration of an amendment to open associate membership to those who spend a "substantial" rather than a "principal" part of their time in science communication.

VICTOR COHN, *Vice President*

The National Association of Science Writers' annual dinner and presentation of the AAAS-Westinghouse science-writing awards was staged 27 December in the East Ballroom of the Hotel Commodore. Earl Ubell, NASW



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president and science editor of the New York *Herald Tribune*, presided.

Ubell also was recipient of the $1000 newspaper division award for nonmedical science writing. Philip Morrison, Cornell University physicist, received a similar award in the magazine division.

William Hines, of the Washington, D.C., *Evening Star*, and Edwin Diamond, science editor of *Newsweek*, were given honorable mention certificates in the newspaper and magazine divisions, respectively.

NATE HASELTINE, *Secretary-Treasurer*

Meetings

Forthcoming Events

March

12–17. American College of Allergists, annual, Dallas, Tex. (P. Gottlieb, 818 Medical Arts Bldg., Philadelphia, Pa.)

13–17. National Assoc. of Corrosion Engineers, annual, Buffalo, N.Y. (W. A. Mapler, 18263 W. McNichols Rd., Detroit 19, Mich.)

13–24. Radiological Health, course in, Cincinnati, Ohio. (Chief, Training Program, Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26)

14–16. Clinico-Pathological Significance of Renal Biopsy, Ciba Foundation symp. (by invitation only), London, England. (Ciba Foundation, 41 Portland Place, London, W.1)

14–16. Inter-Station Supersonic Track Conf., 6th symp., China Lake, Calif. (U.S. Naval Ordnance Test Station, Code 307, China Lake, Calif.)

15–17. Medical Photography and Cinematography, intern. cong., Cologne, Germany. (Deutsche Ges. für Photographie, Neumarkt 49, Cologne)

16–17. Textile Engineering Conf., American Soc. of Mechanical Engineers, Clemson, S.C. (ASME Meetings Dept., 29 W. 39 St, New York 18)

16–18. Aviation/Space Education, 5th natl. conf., Washington, D.C. (Natl. Aviation Education Council, 1025 Connecticut Ave., NW, Washington 6)

17–19. International Medical Conf., Liège, Belgium. (Medical Commission of the FIR, Castellezgasse 35, Vienna II)

19–25. American Soc. of Photogrammetry, American Cong. on Surveying and Mapping, Washington, D.C. (C. E. Palmer, ASP, 1515 Massachusetts Ave., NW, Washington 5)

19–25. Caribbean Region, American Soc. for Horticultural Science, 9th annual, Miami, Fla. (E. H. Casseres, Londres 40, Mexico 6, D.F., or W. H. Krome, Box 596, Homestead, Fla.)

20–22. American Physical Soc., Monterey, Calif. (W. A. Nierenberg, Univ. of California, Berkeley 4)

20–23. Institute of Radio Engineers, 1961 intern. convention, New York, N.Y. (E. K. Gannett, IRE, 1 E. 79 St., New York 21)

20–24. American Surgical Assoc., Boca Raton, Fla. (W. A. Altemeier, Cincinnati General Hospital, Cincinnati 29, Ohio)

20–24. National Health Council, forum and annual meeting, New York, N.Y. (NHC, 1790 Broadway, New York 19)

20–24. Western Metal Cong. and Exposition, 12th, Los Angeles, Calif. (A. R. Putnam, American Soc. for Metals, Metals Park, Ohio)

21–23. American Meteorological Soc., general meeting, Chicago, Ill. (E. P. McClain, Dept. of Meteorology, Univ. of Chicago, Chicago 37)

21–23. American Physical Soc., Division of High-Polymer Physics, 21st, Monterey, Calif. (D. W. McCall, Bell Telephone Laboratories, Murray Hill, N.J.)

21–23. American Power Conf., 23rd annual, Chicago, Ill. (W. C. Astley, Philadelphia Electric Co., 900 Sansom St., Philadelphia 5, Pa.)

21–24. American Assoc. of Anatomists, 74th annual, Chicago, Ill. (O. P. Jones, Dept. of Anatomy, Univ. of Buffalo, Buffalo 14, N.Y.)

21–30. American Chemical Soc., 139th, St. Louis, Mo. (A. T. Winstead, ACS, 1155 16th St., NW, Washington 6)

23–25. American Orthopsychiatric Assoc., 38th annual, New York, N.Y. (M. F. Langer, AOA, 1790 Broadway, New York 19)

23–25. Quantum Electronics, 2nd intern. conf., Berkeley, Calif. (J. R. Singer, Dept. of Electrical Engineering, Univ. of California, Berkeley 4)

23–26. International Assoc. for Dental

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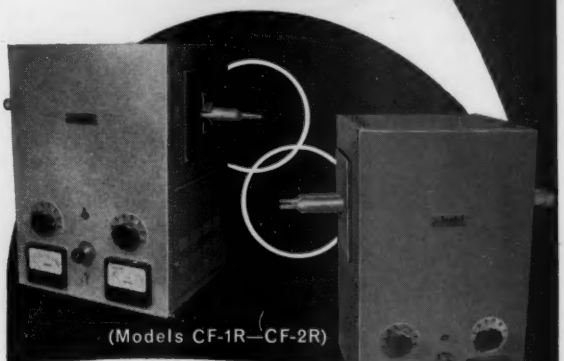

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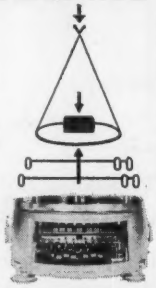

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Research, 39th annual, Boston, Mass. (D. Burrill, IADR, 311 E. Chicago Ave., Chicago 11)

24–29. National Science Teachers Assoc., Chicago, Ill. (R. H. Carleton, NSTA, 1201 16th St., NW, Washington 6)

26–29. American Assoc. of Dental Schools, annual, Boston, Mass. (R. H. Sullens, 840 N. Lake Shore Dr., Chicago 11)

27–31. Temperature—Its Measurement and Control in Science and Industry, natl. symp., Columbus, Ohio. (C. M. Herzfeld, Natl. Bureau of Standards, Washington 25)

30–1. Southern Soc. for Philosophy and Psychology, Atlanta, Ga. (D. R. Kenshalo, Dept. of Psychology, Florida State Univ., Tallahassee)

April

3–6. Massachusetts Institute of Technology, centennial celebration, Cambridge. (Office of Public Relations, M.I.T., Cambridge 39)

3–15. Medical Conference, 11th, Nassau, Bahamas. (Bahamas Conferences, P.O. Box 1454, Nassau)

4–6. Electromagnetics and Fluid Dynamics of Gaseous Plasma, intern. symp., New York, N.Y. (J. Fox, Microwave Research Inst., Brooklyn 1, N.Y.)

4–7. Society of Automotive Engineers, natl. aeronautic meeting, New York, N.Y. (E. W. Conlon and G. W. Periman, 485 Lexington Ave., New York 17)

4–8. National Council of Teachers of Mathematics, 39th annual, Chicago, Ill. (F. A. Janacek, J. S. Morton High School, Cicero 50, Ill.)

5–8. Water Relations of Plants, British Ecological Soc., symp., London. (F. H. Whitehead, Botany Department, Imperial College, Prince Consort Road, London, S.W.7)

6–7. Council on Medical Television, annual, Bethesda, Md. (Institute for Advancement of Medical Communication, 33 E. 68 St., New York 21)

7–8. Eastern Psychological Association, Philadelphia, Pa. (C. H. Rush, P.O. Box 252, Glenbrook, Conn.)

7–9. American Assoc. for Cancer Research, 52nd annual, Atlantic City, N.J. (H. J. Creech, Secretary-Treasurer, Inst. for Cancer Research, Fox Chase, Philadelphia 11, Pa.)

7–9. Fleming's Lysozyme, 2nd intern. symp., Milan, Italy. (R. Ferrari, Organizing Committee, Via Modica 6, Milan)

8–9. Histochemical Soc., 12th annual, Atlantic City, N.J. (H. W. Deane, Albert Einstein College of Medicine, Bronx 61, N.Y.)

9–13. American Assoc. of Cereal Chemists, annual, Dallas, Tex. (J. W. Pence, Western Utilization Research & Development Division, 800 Buchanan St., Albany 10, Calif.)

9–13. American Industrial Hygiene Assoc., Detroit, Mich. (W. S. Johnson, Bethlehem Steel Co., Bethlehem, Pa.)

9–15. American Institute of Nutrition, Atlantic City, N.J. (A. E. Schaefer, ICNND, Bldg. 16A, National Institutes of Health, Bethesda 14, Md.)

10–14. American Soc. of Civil Engineers, Phoenix, Ariz. (W. H. Wisely, 33 W. 39 St., New York 18)

10–14. Detection and Use of Tritium in the Physical and Biological Sciences, intern. symp., Vienna, Austria. (Office of Special Projects, U.S. Atomic Energy Commission, Washington 25, D.C.)

10–15. Federation of American Societies for Experimental Biology, 45th annual, Atlantic City, N.J. (M. O. Lee, 9650 Wisconsin Ave., Washington 14, D.C.)

10–15. Metallic Corrosion, 1st intern. cong., London, England. (Society of Chemical Industry, 14 Belgrave Sq., London, S.W.1)

11–13. Institute of Environmental Sciences, annual, Chicago, Ill. (H. Sanders, Box 191, Mt. Prospect, Ill.)

11–13. Ultrapurification of Semiconductor Materials, conf., A.F. Office of Scientific Research, Boston, Mass. (Miss H. Turin, Conf. Secretary, Electronics Research Directorate, Air Force Cambridge Research Lab., L. G. Hansom Field, Bedford, Mass.)

12–13. Information and Decision Processes, 3rd symp., Lafayette, Ind. (R. E. Machol, School of Electrical Engineering, Purdue Univ., Lafayette)

12–14. Agglomeration, intern. symp., Philadelphia, Pa. (Metallurgical Soc. of the AIME, 29 W. 39 St., New York 18)

12–14. Chemical Soc., anniversary meeting, Liverpool, England. (Chemical Society, Burlington House, Piccadilly, London, W.1)

13–14. Society of Technical Writers and Publishers, 8th annual, San Francisco, Calif. (R. B. Meier, Head Editor, Engineering, Stanford Research Inst., 333 Ravenswood Ave., Menlo Park, Calif.)

17–18. Great Lakes Research, 4th conf., Ann Arbor, Mich. (C. F. Powers, Great Lakes Research Division, 1119 Natural Science Bldg., Ann Arbor)

17–19. Fluid Seal Meeting, intern., Ashford, Kent, England. (Information Officer, British Hydromechanics Research Assoc., South Road, Temple Fields, Harlow, Essex)

17–24. International Congress of Nurses, 12th quadrennial cong., Melbourne, Australia. (Miss D. C. Bridges, Secretary, 1 Dean Trench Street, London, S.W.1, England)

18–20. Chemical Reactions in the Lower and Upper Atmosphere, intern. symp., San Francisco, Calif. (R. D. Cadle, Stanford Research Inst., Menlo Park, Calif.)

18–21. American Geophysical Union and American Meteorological Soc., Washington, D.C. (American Geophysical Union, 1515 Massachusetts Ave., NW, Washington 5, D.C.)

19–21. Southwestern Inst. of Radio Engineers Conf. and Electronics Show, Dallas, Tex. (SWIRECO 61, P.O. Box 7443, Dallas 9)

20–21. Society of Chemical Industry, fungicide symp., London, England. (B. J. Heywood, 103 Harrow Drive, Hornchurch, Essex, England)

20–22. Association of Southeastern Biologists, Lexington, Ky. (H. J. Humm, Department of Botany, Duke Univ., Durham, N.C.)

20–24. Microbial Reactions in Marine Environments, intern. symp., Chicago, Ill. (C. H. Oppenheimer, Inst. of Marine Science, Univ. of Texas, Port Arkansas)

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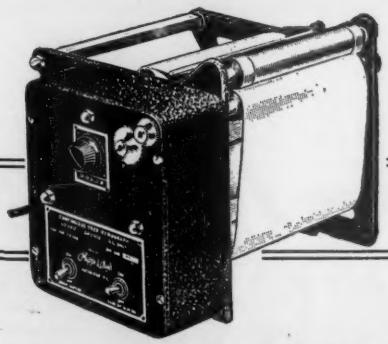

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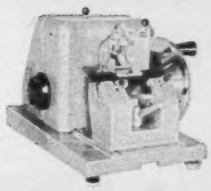

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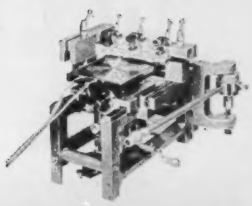

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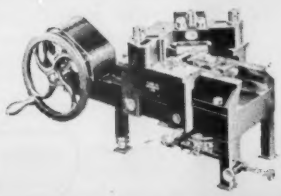

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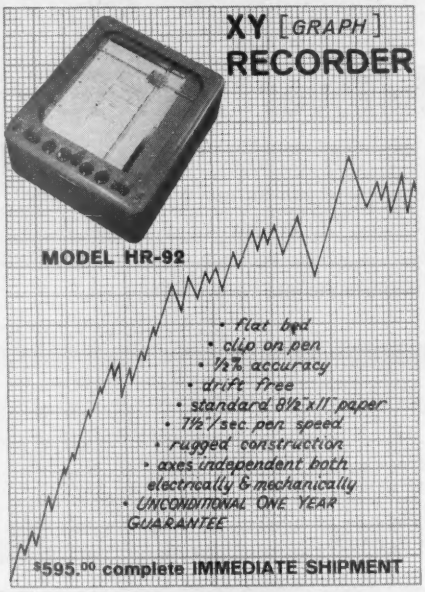

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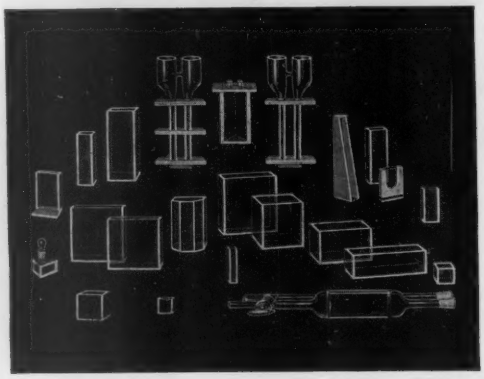

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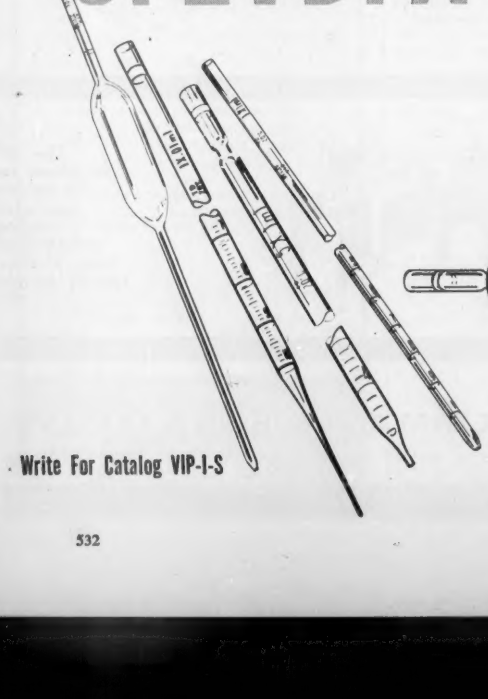

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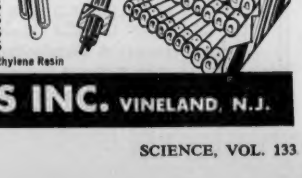

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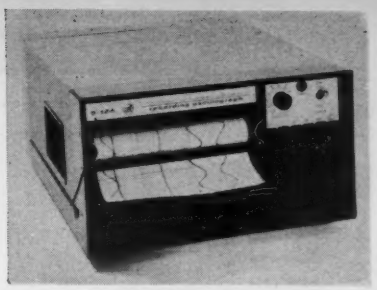

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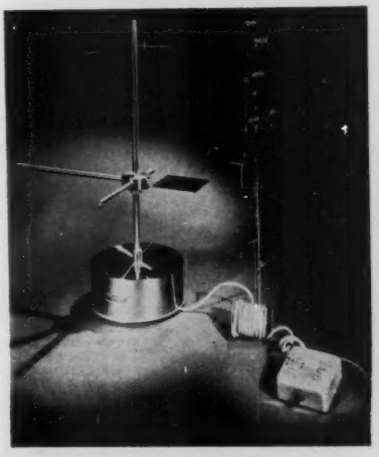

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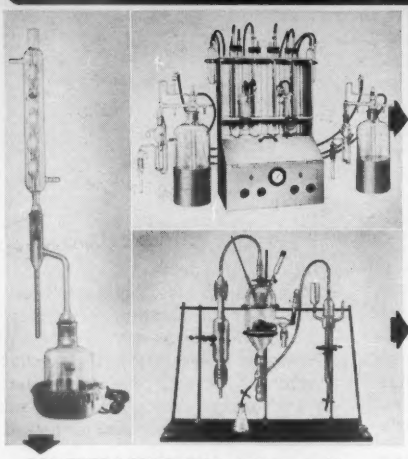

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Ask for Chemostat Bulletin S.

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■ FREQUENCY TRANSLATOR filters and converts the audio spectrum into frequency bands that can be examined individually and simultaneously with a high degree of resolution. Thirty five units are assembled into two racks to provide for the selection and translation of 35 segments, each 140 cy/sec wide, falling between 150 and 5000 cy/sec. An input filter unit is provided for each set of five channels as a means of rejecting particular spectrum portions. It is possible to add or subtract channels individually or in groups of five. (Rixon Electronics Co., Dept. Sci27, 2414 Reedie Ave., Silver Spring, Md.)

■ STROBOSCOPIC ILLUMINATOR features flashing rate of 110 to 25,000 per minute in three ranges with flash duration 1 to 6 μsec. Peak intensities of flashes are 0.21, 1.2 and 4.2 Mca, respectively, on the three ranges. Single-flash intensity is 7 Mca peak. The light source is housed in a parabolic reflector designed to swivel around the lamp. Accuracy is said to be ± 1 percent of reading after calibration on the middle range. Calibration may be performed against power-line frequency by making two screwdriver adjustments. (General Radio Co., Dept. Sci31, West Concord, Mass.)

■ MULTIMETER enables increments of any range to be expanded about any point in the range and displayed on an external servo recorder. The instrument combines a Simpson multimeter with a suppressor power supply and an attenuator. A 5-mv-sensitivity external servo recorder will permit expansions to ± 1 percent of full-scale value. The attenuator permits the expansion to be adjusted to any value from 1 to 100 percent. (Tensor Electric Development Co., Dept. Sci88, 1873 Eastern Parkway, Brooklyn 33, N.Y.)

■ PEAK-READING VOLTMETER is designed to accept and display the peak values; within specified limits, of any positive transient voltage pulse of arbitrary shape. The instrument will detect a peak voltage and initiate readout while blocking further input signals until it is reset. Readout is provided directly in volts as a four-digit decimal value with accuracy said to be ± 1 percent. (Curtiss-Wright Corp., Dept. Sci90, P.O. Box 8324, Albuquerque, N.M.)

■ GAS-VELOCITY METER measures the velocity of luminous, hypersonic gas flow by observing the luminosity fluctuations in the flow. These fluctuations are converted into amplitude variations of electrical signals by two multiplier-phototube transducers spaced 1.2 in. apart. The phase difference between the outputs of the transducers is compensated by a calibrated variable

magnetostrictive delay line that provides indication of the time required for the luminosity variations to travel the distance between the transducers. Velocities are measured over a range of 2000 to 50,000 ft/sec. The meter may also be used to measure vibration frequency or motion as a function of time. (MHD Research Inc., Dept. Sci80, P.O. Box 1815, Newport Beach, Calif.)

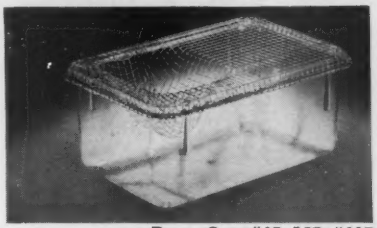
■ RECORDING SYSTEM combines direct writing and photographic oscillographic recording to cover the broad range of frequencies encountered in physiological recording. The direct-writing portion of the system covers events in the d-c to 100 cy/sec range. The photographic section, using optical galvanometers, provides frequency response to 500 cy/sec. The multichannel system makes use of interchangeable plug-in amplifiers that are compatible with both types of recorders. (Sanborn Co., Dept. Sci66, 175 Wyman St., Waltham 54, Mass.)

■ TRANSDUCER EQUALIZER is essentially an analog computer that overcomes the limitations of transducer measuring systems by inserting into the data a complex transducer function that is the reciprocal of the transducer transfer function. The device is said virtually to eliminate undesirable ringing, which results from the excitation of the transducer at or near the natural resonant frequency, and to extend effectively the system's frequency response by several octaves. It can be employed as a single or dual system to compensate for transducer or electrical systems with one or two degrees of freedom. Input impedance is 20,000 ohms shunted by 20 pf; output impedance is less than 1000 ohms. Input signal is nominally ±5 volts at gain of 1; output signal is ±15 volts maximum; gains of 1, 2, 5, and 10 are provided. Pulse response is sufficient to equalize pulses with rise times as short as 0.5 μsec. (Telecomputing Corp., Dept. Sci100, 915 N. Citrus Ave., Los Angeles, Calif.)

■ VIBRATION ANALYZER is a fully automatic system that performs on-line spectral density analysis of dynamic data. Analysis is performed over a band width of 5 kcy/sec with resolution of 50 cy/sec. Energy distribution is encoded at a rate of 5000 readings per second and recorded on ½-in. magnetic tape. The entire spectrum is swept and encoded every 20 msec or on command. An additional unit monitors any selected group of frequencies and warns when amplitude approaches or exceeds a preselected value. Accuracy is said to be better than ±1 percent. (Communications Control Corp., Dept. Sci89, 14707 Keswick St., Van Nuys, Calif.)

A Mousellany of Animal Care Developments

They Said It Couldn't Be Done



Econo-Cage #27, LID #22D

The new Polycarbonate Econo-Cage #27 is clear, autoclavable and unbreakable.

To operate most efficiently animal colonies must use cages which withstand the rough and tumble of mechanized washing systems and the high temperatures at which these systems and autoclaves operate. Because colonies must be inspected quickly, cages should afford maximum visibility. Until now the cages were either transparent or durable, but none had both characteristics.

The new Polycarbonate combines the optical and thermal properties of glass with an *impact resistance unmatched by any other clear material.* A good example of the degree of impact resistance was furnished by a doubting Thomas who could not break the cage by dropping it out of a fourth floor window. Polycarbonate retains this remarkable strength from 275° F. to -40° F. It is the first clear plastic which can be autoclaved repeatedly.

This new material, a linear aromatic polyester of carbonic acid, has a very low absorption level. Odor producing gases are not absorbed, resistance to most acids and basics is very good.

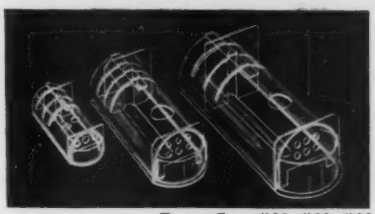
The cage is constructed to N I H Spec. EG-84. For housing mice, the cage is 11½″ x 7½″ x 5″ deep. The cages nest for easy storage.

This is one of the "20 Series" of Econo-Cages, which includes cages of fibre glass, acrylonitrile-styrene-copolymer, polypropylene and polycarbonate. These are all 11½″ x 7½″ x 5″ deep. There are four lid styles which are interchangeable on all "20 Series" cages. Write for complete information on this series.

Working With Restraint

Two new pieces of animal restraining equipment are now available from the Econo-Cage Division of Maryland Plastics, Inc. A small restrainer for mice weighing from 10 to 40 grams (Econo-Cage #88), and a large unit for rats and hamsters weighing from 250 to 600 grams (Econo-Cage #91), are new additions which supplement Econo-Cage #90 for 150 to 300 gram rats and hamsters.

These clear acrylic plastic units afford rapid and safe immobilization of animals, easy access and maximum visibility of animals in restraint. Econo-restrainers prevent unanesthetized animals from attacking tubes, cannulae, and other fixtures; provide extended housing during nutritional studies; restrain animals during administration of intravenous, intraperitoneal, intramuscular, and subcutaneous injections; and are useful for administering intravenous fluid drips and anaesthetic.



Econo-Cage #88, #90, #91

All three sizes have an adjustable tailgate which fits into any of three slots to vary cage length, confine the animal, and serve as a cage door. Openings at the top, bottom, and tail provide easy access to any part of the animal (the bottom slot also permits drainage of animal waste). A hopper permanently attached to the front of the unit includes a trough for granular feeds and a water tube inlet.

The small restrainer, Econo-Cage #88, can be varied from 2″ to 3½″ in length and is 1¼″ wide. The medium restrainer, Econo-Cage #90, can be varied from 4½″ to 6″ in length and is 2½″ wide. The large restrainer, Econo-Cage #91, can be varied from 5″ to 7″ in length and is 3″ wide. All these units can be cleaned chemically or with hot water, they are not autoclavable.

econo-cage

ECONO-CAGE DIVISION
MARYLAND PLASTICS, INC.
9 East 37th Street,
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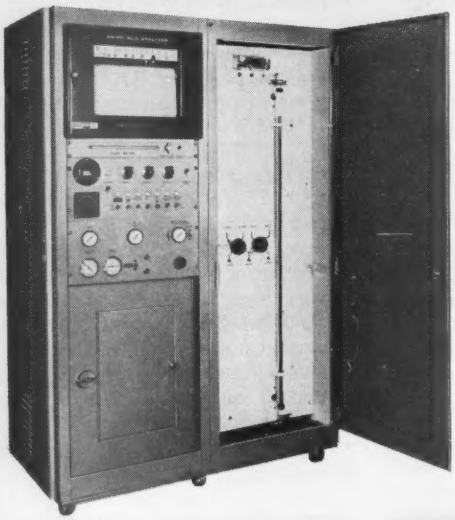

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For complete details write Dept. VG for Bulletin 6000

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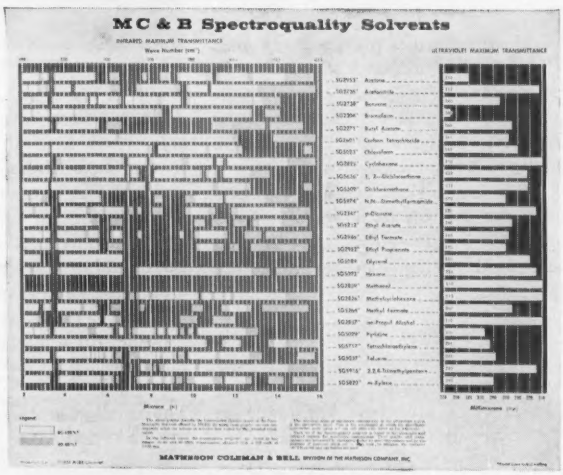

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■ DIFFERENTIAL D-C AMPLIFIER has both input terminals isolated from both output terminals and all four terminals isolated from ground. The unit amplifies low-level signals from d-c to 20 kcy/sec at all gain settings. Gain is continuously adjustable from 10 to 1000 with zero position. Input impedance is 100 kohm. Common mode rejection is said to be 130 db to 100 cy/sec. Output is ±10 volts at ±20 ma or ±5 volts at ±30 ma. (Computer Engineering Associates, Inc., Dept. Sci76, 350 N. Halstead, Pasadena, Calif.)

■ PUNCHED-TAPE VERIFIER AND DUPLICATOR handles one through eight channels in any code structure at 60 characters per second. In verifying, the device stops automatically upon discovery of error and displays error in neon indicators simulating bits. Failure to verify stops the duplication function without punching an erroneous character. (Tally Register Corp., Dept. Sci72, 1310 Mercer St., Seattle 9, Wash.)

■ GLASSWORKING LATHE can be changed from horizontal to upright position in 2 min or less, according to the manufacturer. Length between chucks is 36 in.; radial clearance, 8 in.; chuck capacity, 8 in.; through-spindle diameter, 4 in. Chuck adjustment does not require a key; the tailstock can be locked while the headstock rotates for flaring operations. A synchronous switch stops the motor when the clutch is disengaged; hence the motor cannot be left running accidentally. (Bethlehem Apparatus Co., Dept. Sci75, Hellertown, Pa.)

■ PERFORATED-TAPE RECORDER consists of a tape-transport mechanism, a transistorized electronic circuit, power supply, and housing. Inputs are converted to serially encoded pulse trains. The pulses are recorded by incineration of small holes in a paper tape, with the hole pattern representing the information recorded. Maximum operating speed is 180 decimal digits per minute. An associated tape reader operates at 1200 decimal digits per minute. (Advanced Instrument Corp., Dept. Sci26, 700 S. 4 St., Richmond, Calif.)

■ PHOTOELECTRIC TAPE READER reads blocks of up to 80 bits simultaneously at speeds up to six blocks per second. Stop code can be provided either by external equipment or by any desired hole in the matrix. Use of the sprocket hole as a stop signal results in conventional line-by-line operation. (Photocircuits Corp., Dept. Sci32, 31 Sea Cliff Ave., Glen Cove, N.Y.)

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Blood Plasma Protein Fractionation. B.S., 42, 17 years' production and administrative know-how: serum albumin, immune globulin, and fibrinogen. Isolation of plasma proteins, freeze drying, sterile filtration, and filling. Seeks production and/or development position in same or related field. Box 20, SCIENCE. 2/17; 24

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Director Biochemistry-Microbiology, Ph.D. Desires clinical or pharmaceutical administration. Investigated tracer metabolism, enzymes, cancer, chemotherapy, immunology. East. Box 32, SCIENCE. X

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APPOINTMENT OF DIRECTOR

Applications are invited for the post of **Director of the British Industrial Biological Research Association,** which has recently been formed with the support of the Department of Scientific and Industrial Research to undertake biological investigations into the properties of substances for use in, or in connection with, the production, processing, and packaging of food and cosmetics. The association is contemplating the immediate establishment of a research station at Leatherhead, Surrey, in proximity to other research establishments, and the first task of the director will be to make proposals to the Council of the association for the building of the laboratories, the recruitment of staff, the formulation of a research and testing program, and the provision of administrative services.

Preference will be given to candidates of proved scientific and research attainment. A medical qualification is desirable, and candidates must have had wide general experience in the biological sciences with specialist experience in pharmacology, toxicology, or pathology. The starting salary will be about £4000 per annum, depending on age, qualifications, and experience, and appropriate pension arrangements will be made. Applications should be sent *by 15 April* at the latest to the president of the association, Professor A. C. Frazer, M.D., D.Sc., F.R.C.P., University of Birmingham Medical School, Birmingham 15, England.

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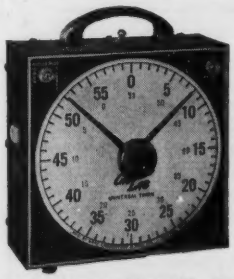

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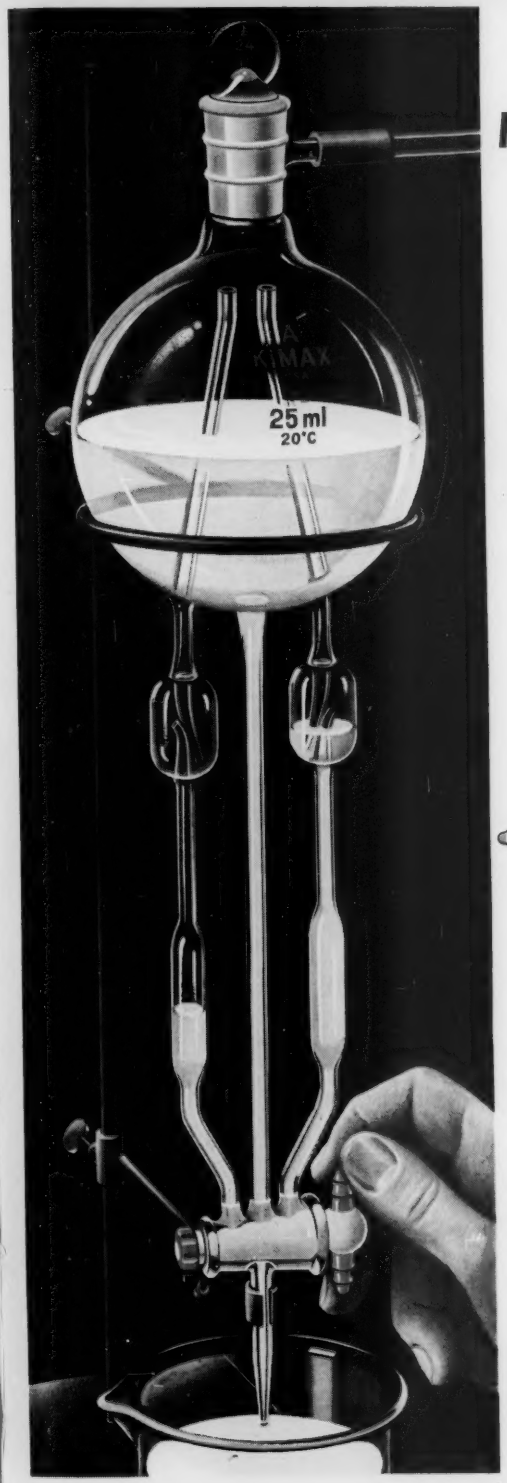

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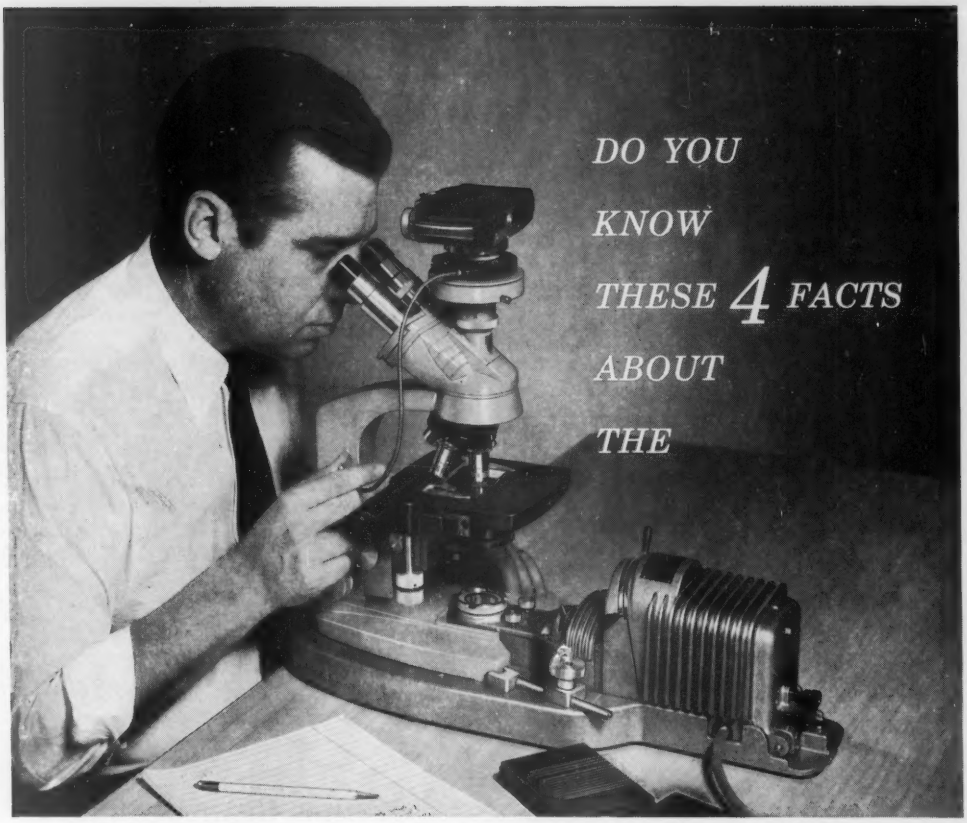

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